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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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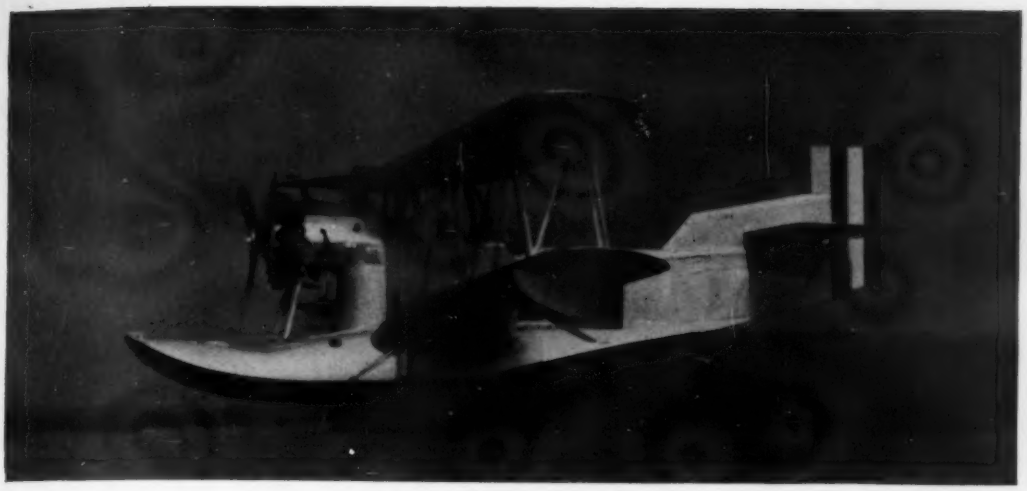

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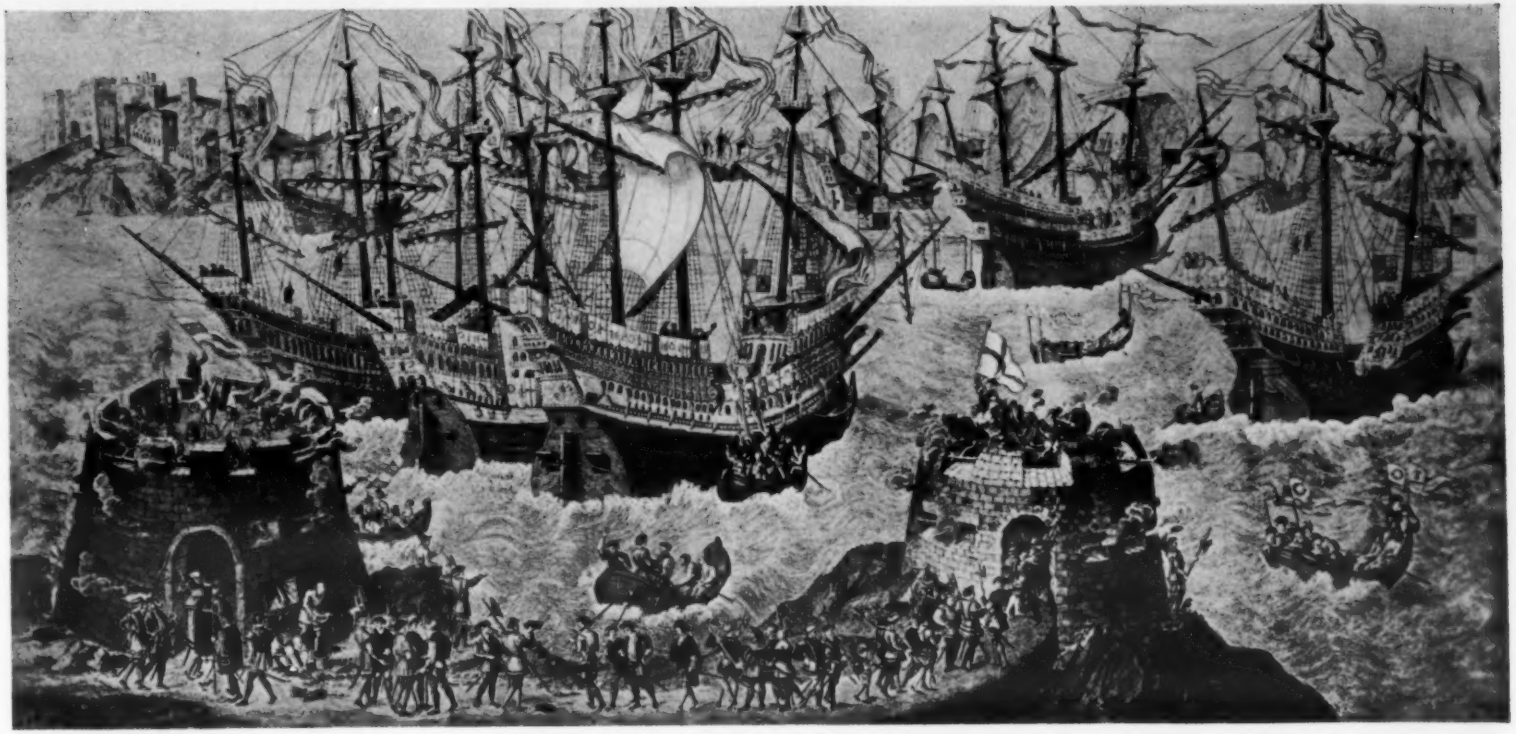
VICTORY OF THE ROMANS OVER THE CARTHAGINIANS, 256 B.C.

Rome, suffering from raids on her coast by the Carthaginians, began developing a naval force to carry the war into enemy territory. At Mylae (260 B.C.) Carthage met her first defeat at the hands of Roman sea power. At Ecnomus (256 B.C.) Rome decisively defeated Carthage in a naval battle in which 700 ships and 300,000 men were engaged.



Courtesy Naval War College

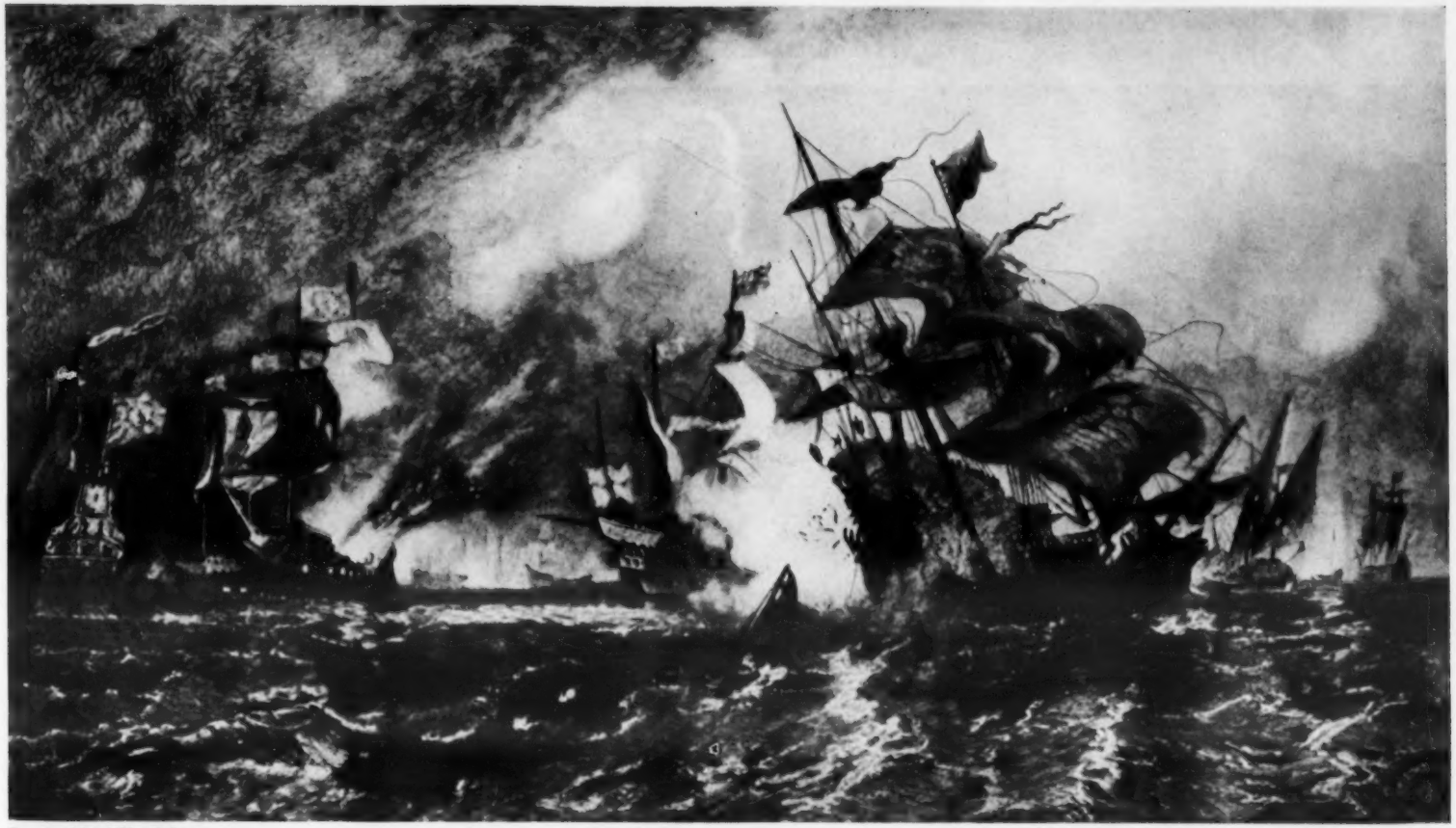
HENRY VIII'S DEPARTURE FROM DOVER, MAY 31, 1520

Henry VIII might be called the father of the British Navy. He took a keen interest in his Navy, established the first Navy Board (1546), and is credited with the adoption of sail instead of oars for the major units of the fleet.

Courtesy Naval War College

THE SPANISH ARMADA SAILING FROM FERROL, JULY 12, 1588

Spain's expedition against England, 1588, aimed at the destruction of British trade rivalry, the overthrow of Protestantism, and a free hand in the subjugation of the Netherlands.



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GRAVELINES, JULY 30, 1588

Driven out of the anchorage in Calais Roads by fireships, the Spanish ships were set upon by squadrons of British ships under Howard and Drake. After eight hours of fighting, in which the Spaniards lost heavily in life, even though not in ships, the Spaniards decided to return to Spain around the Orkneys rather than engage the British ships in a drive through the British Channel.

ing, in which the Spaniards lost heavily in life, even though not in ships, the Spaniards decided to return to Spain around the Orkneys rather than engage the British ships in a drive through the British Channel.

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THE DEFEAT OF THE ARMADA

Of the 130 ships and 27,000 men that started, 50 ships and 10,000 men returned to Spain. The majority of the ships had been sunk or stranded on the coasts of Scotland and Ireland.

Courtesy Naval War College. From the Macpherson Collection

ACTION OFF DOVER, 1652

The war between the Dutch and English (First Dutch War) was primarily a war over trade. The action off Dover was started by Drake attacking Tromp, who was convoying a fleet of merchantmen. Although outnumbered three to one, Drake forced Tromp to retire towards the coast of France.

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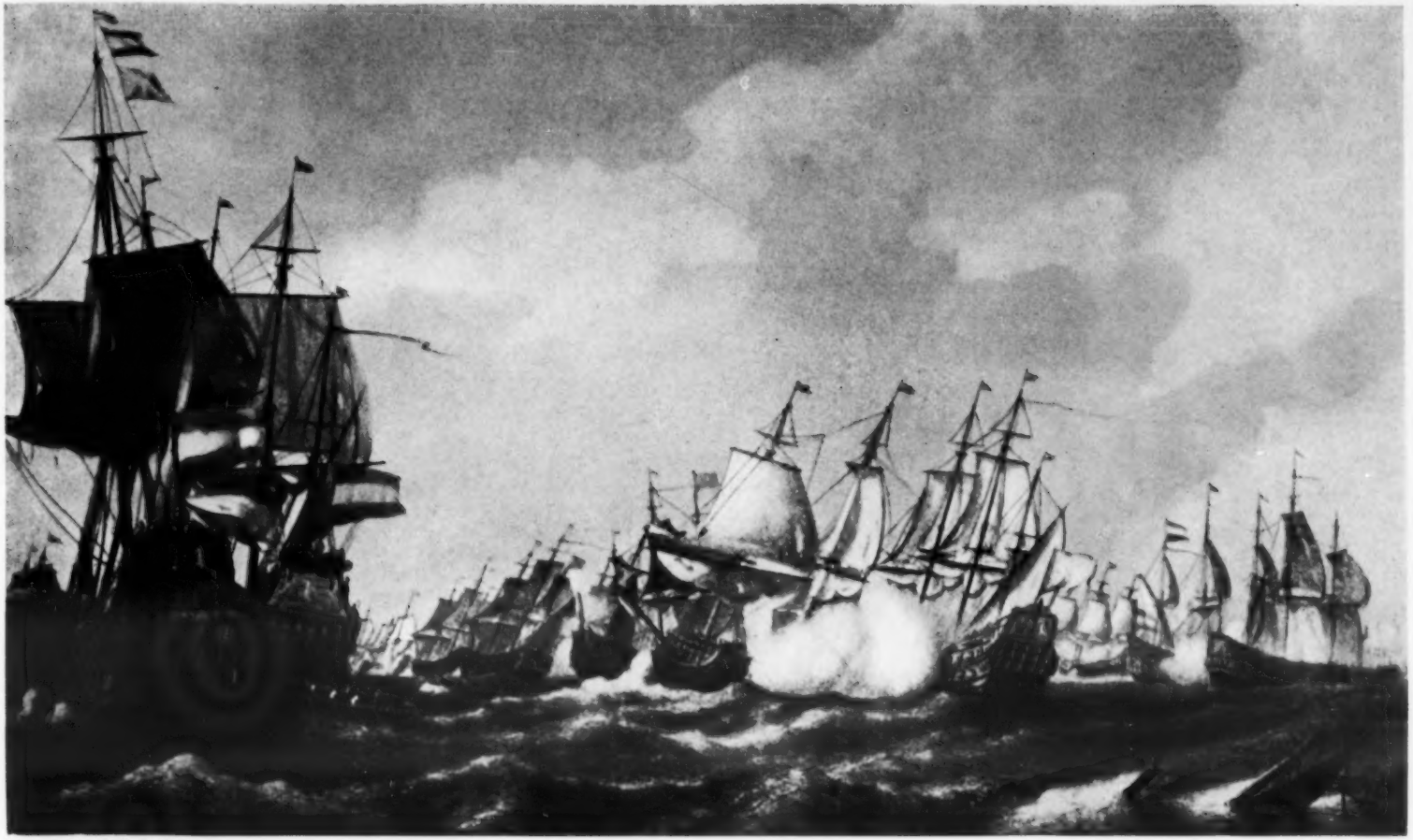
Courtesy Naval War College

THE BATTLE OF LOWESTOFT, 1665

This action of the Second Dutch War was between fleets of approximately equal strength. The British fleet was under the command of the Duke of York (later James II); the Dutch were led by de Ruyter. The English broke through a gap in the center of the Dutch line of battle and concentrated on a part of the Dutch fleet. De Ruyter was forced to retreat.



Courtesy Naval War College

THE FOUR DAYS' FIGHT, 1666

The Dutch forces under de Ruyter and British forces under Monk met on June 1, 1666, and fought furiously for four days. Monk, although outnumbered two to one put up a stubborn fight. As a consequence of this battle, the Dutch controlled the channel and closed the mouth of the Thames.

stubborn fight. As a consequence of this battle, the Dutch controlled the channel and closed the mouth of the Thames.

Courtesy Naval War College.

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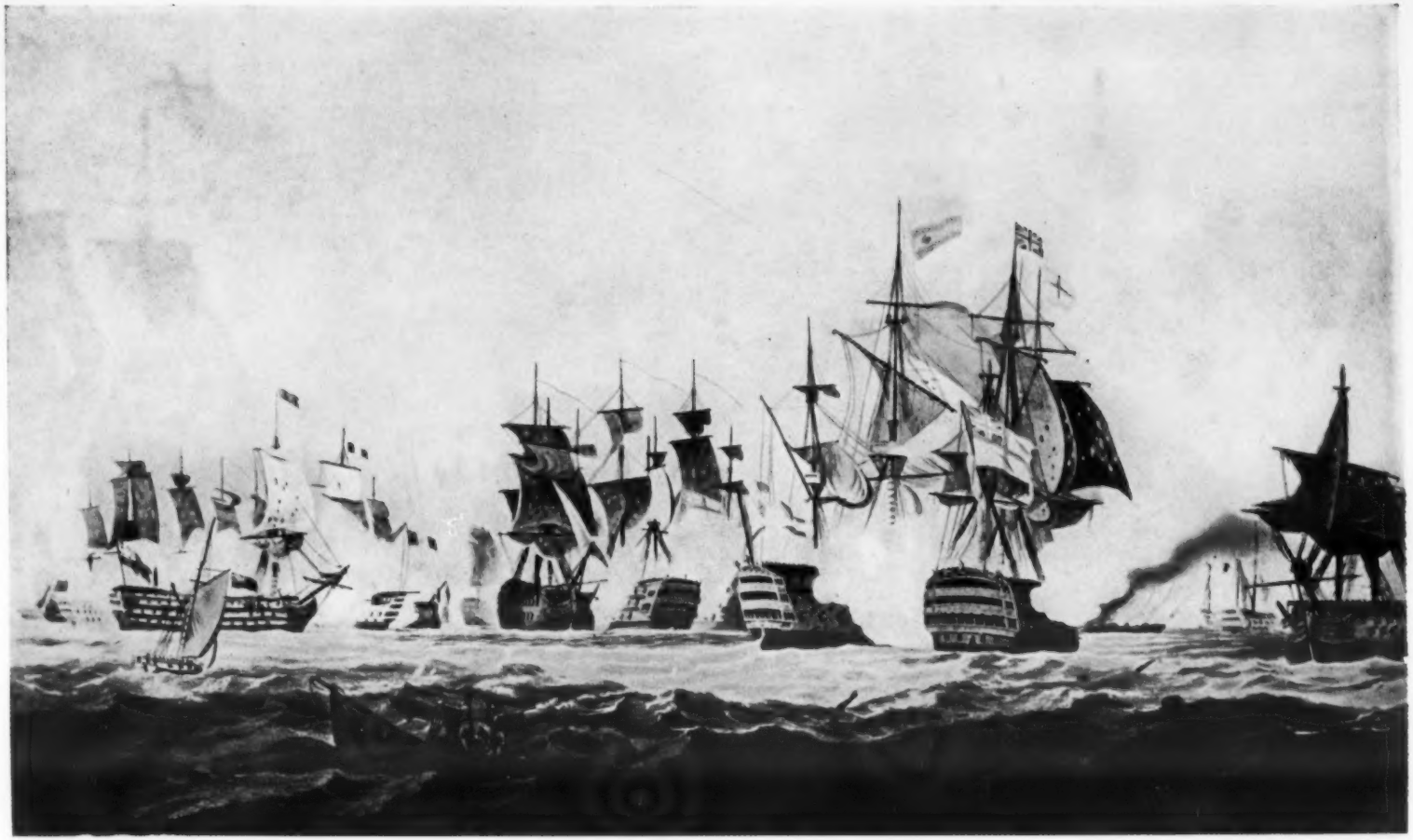
THE BATTLE OF ST. VINCENT, February 14, 1797
(From an aquatint by and after R. Dodd, published June, 1797)

A Spanish fleet of twenty-seven ships of the line sailed from Toulon and passed the Straits of Magellan on February 14, 1797. Jervis, with fifteen British ships of the line, defeated this Spanish force and drove it back into Cadiz.



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THE BATTLE OF TRAFALGAR, OCTOBER 21, 1805

The combined French and Spanish fleet of thirty-three ships was met by twenty-eight British ships under Nelson, and was decisively defeated. Nelson's victory was mainly attributable to his indoctrination of his subordinates. Twenty Allied ships were captured or sunk, four under Dumanoir fled to the Straits, but were later engaged and captured. Nine eventually escaped to Cadiz.

mainly attributable to his indoctrination of his subordinates. Twenty Allied ships were captured or sunk, four under Dumanoir fled to the Straits, but were later engaged and captured. Nine eventually escaped to Cadiz.

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PROCEEDINGS

Vol. No. 55, No. 4 APRIL, 1929 *Whole No. 314*

Prize Essay, 1929

The Speed *of* Battleships

By LIEUTENANT FRANKLIN G. PERCIVAL, *U. S. Navy (Retired)*

War is won by holding on or driving off,
not by successful running away.—MAHAN

MANY changes have taken place since our existing battleships were designed. Not only have our pre-war ideas of the value of speed faced the test of actual battle, but we have had time to find and digest the facts concerning these engagements. The lessons to be drawn, although startling, lost most of their effect due to the slowness with which the truth appeared. Furthermore, the situation has been altered by the advent of new weapons and the improvement of old ones, by the Washington treaty, and by actually testing the protection of one of our latest ships, the incomplete *Washington.* It is only by a careful examination of the entire problem that one realizes how much it has been changed. This subject is again of interest since, in less than three years, we resume the building of battleships. In the following paragraphs, an earnest effort is made to avoid preconceived ideas and to view conditions as they actually exist today.

THE PRESENT VALUE OF SPEED

The battles of the World War are particularly instructive, because they were the first ones fought by modern armored vessels, manned by crews nearly enough equal in training and morale for the engagements to be considered fair tests of the ships themselves. Still further interest is added by the fact that the opposing ships represented two equally antagonistic schools of thought. On the one hand, we had Fisher building ships with the dominant idea that "the first of all necessities is *Speed,* so as to be able to fight—*When* you like, *Where* you like, and *How* you like." (Ch-I-146)* On the other hand, the German ships were the embodiment of Tirpitz's dictum: "The supreme quality of a fighting ship is that it should remain afloat and by preserving its vertical position, continue to put up a fight. . . ." (T-I-173) While it is generally

*In order to avoid footnotes, a parenthetical reference system has been adopted. Within the parenthesis, the first group refers to the author and title, according to the key given below; the second group, roman numerals, refers to the volume, if more than one; while the last group, arabic numerals, refers to the page. Thus (Ch-I-146) means: Churchill, *World Crisis,* Vol. I, p. 146.

Author and Title	*Key*
Churchill, *World Crisis*	Ch
Corbett, *Naval Operations*	Co
Fisher, *Memories and Records*	F
Jellicoe, *Grand Fleet*	J
Mahan, *Lessons of War with Spain*	M
Scheer, *Germany's High Sea Fleet*	S
Tirpitz, *My Memoirs*	T
Wilson, *Battleships in Action*	W

conceded that, on the whole, Fisher was wrong, it is important to determine, as accurately as possible, the extent to which the claims made for high speed are justified. We will therefore now examine, in the light of what actually happened in the war and of subsequent developments, each of the supposed advantages of superior mobility.

Fisher wrote: "It is admitted that strategically speed is of very great importance. It enables the fleet or fleets possessing it to concentrate at any desired spot as quickly as possible. . . . ." (F-II-110) Although he and Tirpitz had to consider distances of only a few hundred miles, it actually worked out that the strategic speeds of their fleets were decided, not by their battleships, but by the relatively low economical speed of their destroyers. While we may look for increases in the size and fuel capacity of future torpedo craft, this is more than offset by the vastly greater distances involved in American strategy. Furthermore, if fuel ships or other vessels of the train are in company, the fleet speed will be decided by the slowest of these auxiliaries. It is, therefore, manifest that battleship speeds will certainly not be so low as to reduce the strategic speed of our fleet.

Another advantage claimed for superior mobility was the power to force or refuse an action. Only twice in the late war was this claim realized, and then under most unusual circumstances. At the Falklands, Sturdee was able to bring on a battle principally because of his unusual luck in having Spee walk squarely into a trap, and partly because of higher speed. Again, at the Dogger Bank, Beatty engaged Hipper, due chiefly to remarkable advance information, and partly to his faster ships. It is noteworthy, however, that in neither case would superior speed have been of value unless accompanied by superior fighting power. This is an impossible combination, under the fixed maximum displacements of the Washington treaty, if we assume equality in numbers and skill. There is certainly no advantage in forcing an action with vessels of superior fighting power.

The occasions on which higher speed was useless for this purpose form an impressive list. The escape of the *Goeben* and *Breslau* was due, not to superior mobility, but to a series of tragic blunders with which we all are familiar. The Heligoland Bight affair was simply a case of light forces, surprised at short range, by raiders of overwhelming superiority. There was no question of escape. At Coronel, no effort was made on either side to avoid action. On December 16, 1914, Beatty was unable to bring Hipper to book, in spite of advance information which placed him between Hipper and Heligoland. At Jutland, Hipper made no effort to avoid battle with Beatty. Later on that same day, Scheer was drawn into action with Jellicoe because of lack of information. The ease, however, with which Scheer avoided battle on August 16, 1916, showed that, with adequate aërial reconnaissance, a skillful admiral can seldom be engaged against his will. The important point is that, in all of these cases, superiority in speed either did not figure or failed to bring on an action. If the likelihood of forcing a battle under the conditions of the late war was slight, it dwindles into insignificance for future wars, where aërial scouting may be taken for granted. If we also recall the impossibility of getting superior fighting power in the same hull with superior speed, on a fixed maximum displacement, this claim must be dismissed.

The question naturally arises, how can a weaker and unwilling fleet be compelled to fight? Tirpitz answers thus: "We may be forced to give battle under unfavorable circumstances, for the mere honor of our arms. The English need only to bombard Heligoland one morning from the north." (T-II-98) Scheer also wrote: "They had it in their power to compel us to meet them in the North Sea, immediately they made an attack upon our coast." (S-20) If we accept these statements, we must conclude that the ability to force an action—in other words, to take the offensive with its attendant advantages—depends not upon superior speed, but upon the wide margin in striking and resisting power prerequisite to offering battle near the enemy base.

Perhaps the greatest tactical advantage claimed for the faster squadron was that it could choose the range at which to fight. As Fisher stated it:

> . . . . speed was armor when associated with big guns because the speed enabled you to put your ship at such a distance that she couldn't be hit by the enemy, so it was the equivalent of impenetrable armor although you had none of it, and you hit the enemy every round for the simple

reason that your guns reached him when his could not reach you. (F-I-100)

This was an attractive theory.

Sir Alfred Chatfield, who commanded the *Lion* in all her engagements, pointed out its weakness in these words:

Those who have been in action know perfectly well that in ninety cases out of a hundred, the factor which determines the range at which you will fight is the Clerk of the Weather. If you cannot see more than 10,000 yards, it is no good having speed which would enable you to keep 25,000 yards off. You have got to come in to the distance at which you can see the enemy, and when you come in to that range, then the man who has got plenty of speed but no protection, finds himself in a very awkward position. That is what has happened time and again.

He might have added that, if the slower ships have sufficient protection, they can compel the faster squadron to close the range, if the latter wish to make their fire effective.

Aside from further modification due to the use of smoke, the Washington treaty, which fixed the maximum caliber of guns, precluded any practicable application of this theory to future battleships. With superiority in range ruled out, all that the faster and more lightly armored ships can do is to select the distance at which they prefer to be sunk—and they will not have a wide selection.

We also used to hear that superior speed enabled one to choose the bearing on which to open fire, in order to take advantage of light or wind. However, in all the actions of the war, the bearing on which fire was opened depended on the relative positions of the opposing forces prior to contact. Subsequent courses were dictated by the desire of one or the other to fall back on its main body or base. Although it is theoretically possible for the faster fleet to gain this advantage, the situation has changed greatly since the war, as will be seen in the next two paragraphs.

The most favorable direction of the wind has become a complicated problem. Formerly, it was considered best to have it on the engaged beam to get the smoke from one's own guns and funnels out of the way as quickly as possible. Now, so far as the use of gas and smoke screens are concerned, it is best to have the wind on the unengaged beam. If a sea is running, spray interference will be reduced with the wind on the unengaged bow. The advent of carriers still further complicates things. It is advantageous to that fleet whose carriers have the least margin of superiority in speed to have the wind ahead, while the other side will want it astern. Finally, if a course and relative bearing be decided upon as most desirable in regard to wind, the visibility may be unfavorable. Thus, the many factors tend to cancel one another and the comparative value of any one of them is reduced.

Furthermore, the great increase in probable battle ranges means that a proportionally longer time is required to change the relative bearing; for example, it requires three hours to effect a change of bearing at 30,000 yards which would require only one hour at 10,000 yards. The probable employment of fleet submarines, motor torpedo boats, light mine layers, and torpedo planes increases the likelihood of reversals in course at short notice. Consequently, any maneuvers which require a long time for completion are of doubtful value. Even if the desired position is gained, the advantage may be reversed by shifting winds, or by sunset, as at Coronel; or it may be nullified by clouds, mist, smoke, a flat calm, a change in the strategic situation, or a dwindling fuel supply. Finally, a fleet can usually withdraw from a disadvantageous position. Since superior speed did not gain this possible advantage in any action of the late war, and seems still less likely to gain it in future battles, we may classify this claim as doubtful.

The ability of the faster fleet to form tactical concentrations on portions of the slower fleet was formerly much dwelt upon. Beatty, for example, concentrated on the *Blücher* and sank her at the Dogger Bank. This was due, however, not to Hipper's lower speed, but to his faulty formation and the placing of his weakest ship in the most exposed position. Sixteen months later at Jutland, Jellicoe twice effected a concentration on the head of the German column. Superior speed did not figure in the first concentration because, at the time, Jellicoe was making only fourteen knots, to allow Beatty to draw ahead. The second concentration was due to Scheer's flinging his leading ships headlong at the British column, either to effect a breakaway, or because of his mistaken idea as to the location of the Grand Fleet. Either concentration could have been avoided, had there been adequate

aërial reconnaissance and, in both cases, the fleet unfavorably placed was able to withdraw. Since those days, the situation has been modified by an increase in gun ranges, a decrease in the number of battleships in the world's fleets, by dependable aërial scouts, and by improved systems of communication. The short columns of today can be handled with parade-ground precision and any concentration due to superior speed easily avoided.

The final tactical advantage claimed for superior mobility was that it rendered possible the overtaking and destruction of a beaten and retreating fleet. The prerequisite is, however, to beat the enemy and make him wish to retreat. This calls for superior fighting power. So long as the Washington treaty remains in force, this cannot be obtained in the same ship with superior speed. Since mobility is the most vulnerable of the qualities of a fighting ship, it seems likely that the defeated fleet will have lost any superiority in speed before it seeks to withdraw. Even so, an immediate direct pursuit can be prevented by a liberal use of smoke, mines, and torpedoes. We now have, however, increased facilities independent of battleship speeds, for harrying a retreating fleet. Fast cruisers, destroyers, motor torpedo boats, light mine layers, and torpedo and bombing planes afford effective means of delaying a demoralized enemy. Hence, our aim should be to produce battleships of the maximum fighting power and trust that the retreating fleet will have lost its superiority in speed, or that our light forces will be able to delay them sufficiently for our battleships to reopen fire.

Six advantages claimed for speed have been investigated. Five of these cannot be substantiated under existing conditions and the other must be classified as doubtful. While we should not go to the opposite extreme of assuming that speed is of no value, we cannot escape the conclusion that its importance has been greatly exaggerated.

A remarkable shift in authoritative opinion on this subject has taken place since the war. Jellicoe affords an interesting example of this. Here is a level-headed, conservative officer of wide experience, considered by many to have the keenest mind in the Royal Navy. Of him, Fisher wrote in 1912, to Churchill: "I yesterday had an illuminating letter from Jellicoe. . . . . He writes to me of new designs. His *one, one, one* cry, *Speed!*" (Ch-I-146) After the fiery blasts of war had blown away the clouds of theory, Jellicoe saw the rugged, unmistakable outlines of truth and wrote:

> The loss of the *Good Hope, Monmouth, Queen Mary, Indefatigable, Invincible, Defense,* and *Warrior,* and the considerations to which these losses gave rise, convinced naval officers afloat, even if they did not convince others less intimately associated with the Fleet during the war, that ships with inadequate defensive qualities are no match for those which possess them to a considerably greater degree, even if the former are superior in gun power. (J-306).

His pre-war cry was speed; his post-war cry was protection.

If Jellicoe, with many of his contemporaries, could be led so far astray by peacetime theories, we should surely investigate the causes underlying these wide-spread delusions, in order that we may guard against future epidemics of unsound thinking. The following section is devoted to such an inquiry.

THE PRE-WAR SPEED CRAZE

The principal factor in producing this unfortunate trend was probably the influence of the Russo-Japanese War. The advocates of speed pointed out that the Japanese had the faster fleet, used their mobility to advantage, and won every engagement. The weak spot in this argument was that it ignored the human element. Any lessons drawn from this war regarding material, were of doubtful value, due to the great difference between the training, discipline, and morale of the opposing forces. As further examples, exaggerated ideas also developed as to the value of armored cruisers and the effectiveness of high-explosive shells against armored vessels, simply because the Japanese were successful with them. Instances from this war were continually cited by Fisher in support of his high-speed theories. The influence of this brilliant and powerful officer was so great that it deserves special consideration.

Fisher, like most geniuses, had a mental soft spot. His unfortunate aberration was speed. To make matters worse, there was no hope of reasoning with him, for he not only had implicit confidence in his own ideas, but was fiercely intolerant of criticism. First of all, this colorful admiral secured himself from outside interference by winning the support of the press and the politicians.

He accomplished that feat partly by his remarkable personal prestige and partly by his ability to draw striking analogies and to coin pat phrases or slogans with which he "sold" his ideas. This born sales manager then proceeded to deal with rebels in the Navy, either blistering them with ridicule or eliminating them by the "ruthless, relentless, and remorseless" exercise of his power as first sea lord. The wonder is, not that Fisher had his way, but that anyone with contrary views dared to approach this smoldering volcano of derision, wrath, and vengeance.

Fisher's ideas on speed spread to other navies. In those days, just as Savile Row dictated what the well-dressed man should wear, so Whitehall set the styles in fighting ships. Aside from this, there were minor naval powers obliged to adopt tactics of the "hit-and-run" variety in which speed was the prime requisite. Faster ships for the British obviously meant still faster ships for them.

The influence of the war colleges was also making itself felt. These valuable institutions held game-board maneuvers which had an inevitable weak spot in that speed was the one quality of a fighting ship that could actually be demonstrated on the board. Protection was assigned an arbitrary weight, but here an element of artificiality was introduced, the full effect of which was not then appreciated. Not only did the actual working out before one's eyes of the value of speed impress it on the mind, but its continual demonstration tended to magnify it out of all proportion. On the other hand, the absence of any way, short of actual battle, of illustrating the value of protection, tended to reduce steadily the estimated importance of this factor. Peace-time maneuvers of the fleets had the same weakness. The extent of this artificiality can be appreciated by recalling the pre-war estimate of the relative battle life of battleships and flimsily protected battle cruisers.

Still other elements of artificiality were the inability to reproduce either the mental hazards or the time element of actual battle. On the game board, ships are handled with a meticulous care that one cannot expect in the heat of an engagement. Certainly, it is difficult to believe that some of the moves at Jutland would have been made on the game board. Ships that are tough enough to stand a little rough handling will probably fare much better in an actual battle than they do in maneuvers. This must not be mistaken for an ill-judged condemnation of maneuvers, game board or otherwise. Their value is unquestioned, so long as these elements of artificiality are recognized and allowed for.

The war colleges also very properly stressed the value of the offensive. Unfortunately, at this time, high speed was popularly associated with a dashing offensive—high speed meant the offensive; the offensive meant victory; and, what was more, you could prove it by every engagement of the Russo-Japanese War. Here was apparently an iron-clad case. Yet it was dead wrong, because it ignored the most potent single factor in warfare, "the power that lies in the hearts of men."

The speed bubble was still further inflated by a number of other subtle psychological factors. The appeal of a fast ship to the imagination, the undeniable fascination in handling high-powered vessels, the spirit of competition, and the inclination of engineers to think of ships too much in terms of their own specialty with resulting distorted ideas of progress—all tended to increase speed. Then, unfortunately, there was something suggestive of boldness and dash in calling for speed and decrying protection; while, still more unfortunately, there was something suggestive of timidity and passivity in holding out for the latter vital but unromantic quality. This period, moreover, marked the beginning of the present speed-mad age. It was only to be expected that this world-wide craze would be felt in navies. Finally, there was the missionary spirit. Men like to spread a new gospel. They advocated higher speed with the same fanatical fervor with which others since have preached air-mindedness. It is truly remarkable that so many insidious but potent influences should have united to augment this unfortunate trend. Thus it was, in the tranquil airs of peace, that a showy bubble grew and grew, only to be burst at the first contact with the grim realities of war.

This was no isolated instance of losing touch with actuality, never likely to be repeated. Contemporaneously with the growth of the speed craze afloat, the general staff of the French Army became so obsessed with offensive doctrine that they adopted

their disastrous Plan XVII, without first assuring themselves that material conditions permitted an offensive and, worse still, without providing an alternative, in case their offensive broke down. Any officer who attempted to point out the impracticability of the plan merely jeopardized his own future. Here we have the artificial viewpoint and the assumption of infallibility, with the same severe repression of opposing views; the identical rock on which Fisher foundered.

In both cases, it is noteworthy that the individual or group at the head became infected with an erroneous idea, refused to consider the possibility that they *might* be wrong, and treated those with contrary opinions as public enemies. Listening to opposing views is something like taking a vaccine; it occasionally causes some temporary inconvenience, but it is an excellent safeguard against the contagion of unsound theories.

The obvious lessons are: the erroneous conclusions drawn when the human element is ignored in studying any war; the necessity for recognizing and guarding against the artificial viewpoint which tends to develop in peace time; and that the latter can best be done by open-mindedness, by invariably according a fair hearing to minority views and by never basing a decision on a theory if it is possible to base it on facts. As Mahan says: "Current opinion and plausible impressions should always be thoroughly tested; for if erroneous they work sure failure and perhaps disaster."

So far, we have discussed the value of speed and the factors which produced the speed craze. It is necessary, however, to review the present situation in regard to armament, ammunition allowances, and protection; for, with a fixed maximum displacement, any increase in one of these requirements reacts on each of the others. The extent to which this is true can best be shown by a concrete example.

Many naval officers would probably assent to the proposal that we follow other powers by going to twenty-three knots for our next battleships. Suppose that, instead of increasing their speed by two knots, we decrease it by that same amount. We could get nineteen knots with approximately 45 per cent of the power required for twenty-three knots. If, for the higher speed, machinery requires 10 per cent of the displacement, we would save 5.5 per cent or 1,925 tons. Actually, the saving would be greater, because the lower speed permits a form of hull which weighs less and requires a smaller tonnage for equivalent protection. With perhaps 2,000 tons liberated for use elsewhere, we could make substantial additions to armament, ammunition, or protection. For example, if the latter is allotted 30 per cent of the displacement, and we use 1,400 tons for additional armor, we could make the vertical armor approximately two inches thicker and have proportional increases elsewhere. Bearing in mind this inseparable relation between the different characteristics of a battleship, let us examine each of the other factors.

THE ARMAMENT SITUATION TODAY

One of the astonishing lessons to be learned from Jutland was the powerlessness of the secondary batteries of capital ships to break up even minor destroyer attacks. The first of these was launched almost simultaneously by Beatty's and Hipper's destroyers during the run southward. They met between the lines; two German destroyers were sunk and the remainder retreated. Part of them sought safety around the rear and part around the van of Hipper's battle cruisers. These last Commander Bingham in the *Nestor*, followed by the *Nicator*, turned to chase at full speed. In Corbett's words:

> . . . . he continued to chase till he had reached a good position for the *Lützow*, when, turning to attack, he fired two torpedoes at 5,000 yards. But Admiral Hipper was ready for him with the same foiling manœuvre as our own, and just as the *Nestor* fired the Germans suddenly turned away, and both torpedoes missed. The *Nicator* had no better luck. But Commander Bingham was not yet satisfied, and followed by the *Nicator* he turned eastward after his prey. Undeterred by a rain of shells from the secondary armament of the enemy, as well as from the *Regensburg*, they pressed on till they were abeam of their targets, and fired again at 3,500 yards. Again there was no hit, and miraculously dodging the enemy's rapid salvos they turned back to escape. . . . . Commander Bingham in dodging back from his second gallant attack had had two boilers put out of action by the *Regensburg*. (Co-III-339)

The startling thing about this affair is that two destroyers, headed in the same general direction, but on converging courses with a powerful division of battle cruisers, could run from a position on the quarter of the latter up until abeam, closing the range from 5,000 to 3,500 yards; then de-

liver a second attack and turn away unscathed. The hits which disabled the *Nestor* were made by the *Regensburg* after they had turned away. In view of the proved excellence of German gunnery in other respects, we should hesitate to attribute this to culpable inefficiency. It is a very different matter to hit a target, towed on a straight course at low speed, from what it is to hit a destroyer zigzagging widely at thirty knots, partially obscured by smoke and the splashes of shells from other ships. While great improvement in fire-control instruments and methods have been made since Jutland, we must make due allowance for the mental hazards of battle.

Jellicoe reports a similar experience as follows:

> . . . . at 7:10 P.M. a flotilla of enemy destroyers, supported by a cruiser, was observed to be approaching. . . . . A heavy fire was opened on the destroyers at ranges between 10,000 and 6,500 yards. At the latter range the destroyers turned and passed towards the rear of the line in a heavy smoke screen. One destroyer was seen by several observers to sink from the effects of gunfire. . . . . The 4th Light Cruiser Squadron and the 4th and 11th Flotillas had been delayed in reaching their action station at the van until about 7:10 P.M., owing to the turns to the westward made by the Battle Fleet to close the enemy . . . . [and were] not very well placed for the first attack for the reason given above. . . . . (J-358, 361)

At this time, the Grand Fleet was disposed roughly in a quadrant athwart the course of the attacking destroyers, so that the battleships were in an exceptionally favorable position to open an effective fire. Furthermore, those of them that had no other target turned their turret guns on the destroyers. They had everything in their favor, including light. Yet, of the attacking flotilla, only one boat, "the *S-35* was sunk, struck amidships by a heavy projectile." (W-II-158)

It is also noteworthy that the British light forces were not in good position for counterattacking. Although the factors which produced this situation may be guarded against in future, these vessels are now subject to many new hazards. Onslaughts by bombers, torpedo planes, or motor torpedo boats may drive them from position. Therefore, in future battles, there is at least as much likelihood as there was at Jutland that light forces may not be in place for counterattacking. Under the circumstances, we are driven to conclude that more reliance must be placed on secondary batteries for repelling destroyer attacks; and that these batteries must be strengthened to meet this responsibility, for which they were so pathetically inadequate at Jutland.

The development of aircraft has further altered the situation as follows: antiaircraft batteries and ammunition must be provided; protection must be increased; planes, supplies, shops, catapults, and personnel must be added. All this means extra weight.

The importance of the main battery is clearly recognized. It should be strengthened, if possible, but we should not forget that it would be of no value at the bottom of the sea. The secondary and antiaircraft batteries must first be augmented sufficiently to provide reasonable insurance that the gun platform will be kept afloat to engage vessels of its own type.

FUTURE AMMUNITION ALLOWANCES

One point clearly demonstrated in the war was the necessity for more armor-piercing shells. At Coronel, the *Scharnhorst* and *Gneisenau* fired approximately half their 8-inch projectiles to sink two hopelessly inferior cruisers, which offered no effective resistance. (W-II-50, 55) "At the Falklands the two British battle cruisers used up nearly three-quarters of their ammunition to sink two weaker antagonists, using 12-inch guns against 8.2-inch." (Ch-I-270) When Beatty withdrew at the Dogger Bank, "the *Seydlitz* had only two hundred rounds of ammunition for the guns." (S-85) Scheer states that at the time of his final breakaway at Jutland, "the leading ships of Squadron III could not have fought for any length of time, owing to the reduction of their supply of ammunition by the long spell of firing." (S-166) This is a particularly serious matter, for this expenditure took place almost entirely in the preliminary phase of the battle, and resulted in no serious damage to the target ships. After regaining his base, Scheer apparently realized that his allowance of projectiles and powder was hopelessly inadequate for a serious engagement with the Grand Fleet; for, in discussing possible operations the following winter, he wrote: "On the other hand, the short days had this advantage; that we could time a battle so that our munitions did not give out." (S-166)

Not only must we provide more armor-piercing shells, but we must still carry some high-explosive shells for use against cruisers and destroyers. Should we not make the ammunition allowance for the main battery equal to the accuracy life of the guns and continue to experiment with a view to increasing that life?

We have the smaller guns still to consider. The additions to the secondary battery require corresponding increases in magazine capacity. Then we must provide some gas and star shells, besides quantities of anti-aircraft ammunition, none of which figured in pre-Jutland designs.

If we carefully review all these requirements, it is clear that the tonnage devoted to ammunition in existing battleships must be approximately doubled.

ADDITIONAL PROTECTION NEEDED

According to unimpeachable authority, thicker horizontal armor must be fitted as protection against plunging fire and aërial bombs. The report of the naval board which tested the protection of the incomplete *Washington*, after describing certain experiments, stated that, "this danger to a battleship must be met by thicker decks." Furthermore, the "Navy Special Board Bearing on Proposed Department of Aëronautics" reported: "By armoring the battleship's deck with six or seven inches of armor, we at one and the same time effectively meet any practicable attack from the air and also the attack by gun projectiles fired at the greatest probable ranges." This is approximately twice the thickness of the protective deck in our newest ships.

This increased demand for horizontal armor has not been offset by any reduction in the necessity for vertical armor. Visibility conditions may necessitate fighting at short ranges where the latter would be just as essential as ever. Obviously, our fleet cannot run for home every time the visibility drops.

We should not forget that there has been a great improvement in the effectiveness of armor-piercing shells since Jutland. Jellicoe has described (J-69) the defects in British projectiles at that time. This means that the largest properly designed shell which has been tested in battle is the German 12-inch. Even the gunnery tests against the incomplete *Washington* were conducted with 14-inch ammuntion. It is unnecessary to dwell on the greater destructiveness of the 16-inch shell which is now standard.

Another post-Jutland development in gunnery has been the effort to eliminate dispersion. This brings up the possibility of two or more shells striking closely enough together to smash in an entire section of armor. We must not only have armor plates thick enough to resist holing, but the framing back of the armor must be heavy enough to withstand unprecedented blows. The British evidently appreciated this, for Jane mentions as one of the features of H.M.S. *Hood*, "strong framing." We should note that the *Lion* did have a section of armor driven in at the Dogger Bank. (W-II-98)

The need for better protection of the forward end of the ship was clearly demonstrated at Jutland. The *Lützow* was sunk, due entirely to lost buoyancy forward. The *Seydlitz* was brought in with her forecastle awash. She would have gone under, but for the calm sea and the short distance to port. Other vessels came in, dangerously down by the head. That the Germans appreciated the necessity for increased protection forward is indicated by the following:

> "Another project that did not mature was the construction of Krupp's dreadnought destroyer. This was to be a vessel larger than any warship hitherto built, with a low freeboard to minimize target area, plated from end to end with massive armor and mounting a number of 18- or 20-inch guns, whose enormous shells would have pulverized any battleship they hit. The idea was to build four of these mastodons, which would constitute an 'iron division,' superior in fighting power to eight or a dozen ordinary battleships and use them as the spearhead in a great attack on the British fleet." (Hector C. Bywater, Baltimore *Sun*, October 25, 1923).

The significant words are "plated from end to end with massive armor." Apparently they planned to run the armor belt the full length of the ship. This is a point of particular interest to a power which might be compelled to fight thousands of miles from any well-equipped base. It would also provide urgently needed additional space for magazines.

The necessity for better underwater protection is also clear. Although the incomplete *Washington* easily withstood the explosion of three 2,000-pound bombs at some distance from the hull and two 400-pound torpedo war heads in contact with the hull, we must allow for increased effectiveness of

these weapons. Even as long ago as 1918, the Germans produced a torpedo whose "explosive charge . . . . was 250 kilos (550 pounds) of a material that had three times the explosive power of guncotton." (S-341) We may reasonably expect to see more powerful war heads before our new ships have been long in commission. A gradual increase in the size of bombs which planes can lift from the deck of a carrier is also probable. Our new ships must, manifestly, meet the conditions, not of 1916, but of 1936 and 1946.

Still further demands must be met. The need for larger conning towers, particularly on flagships, is too generally appreciated to require discussion. Defense against gas also requires additional weight. We must, moreover, provide some protection for personnel that have hitherto been left in the open, since the hazards to which they are exposed have multiplied.

The protection of fire-control tops demands attention. They must obviously be proof against falling shrapnel and the bullets from attack planes. This necessitates a substantial steel structure from which observation is exclusively by periscope. The bomb menace not only calls for reducing the horizontal target offered by the tops, but reinforces the existing necessity for better protection of vital communication cables and a less vulnerable supporting framework.

It is proposed to meet these requirements by a hexagonal heptapodal mast, differing from that of the *Mutsu* in that its struts would be small cylinders with thick walls, instead of large cylinders with thin walls; in that the struts would approach but not meet at the top; and in that the mast would be entirely enclosed except for the levels devoted to navigating and signal bridges. These latter should project out from the mast in order to provide a clear view overhead, which has now become as important as a clear view around the horizon. Emergency cabins, chart house, etc., would be inside the mast. The feature of this mast is that the small thick-walled struts form an unusually rugged support for the top, as well as partially splinter-proof conduits for vital communication cables. These cables might be in duplicate or triplicate so that communication would be uninterrupted, even though more than one strut were shot or blown away.

It is also proposed to build a similar but shorter mainmast just abaft and slightly lower than the stack. This would eliminate smoke interference in the after top and permit a wider arc of antiaircraft fire for the after group of guns. A further advantage of this grouping is that it would give our ships a distinctive silhouette, instantly recognizable, day or night.

The greatly increased requirements for armament, ammunition, and protection on the one hand and the deflated value of speed on the other, suggest that we reduce speed to liberate the necessary tonnage. There are certain points in connection with such a step which have not yet been discussed. They will be taken up in the following section.

FURTHER ASPECTS OF SPEED

The advent of fleet submarines and aircraft carriers bears on this question. Due to the relatively low surface speed of submarines, and the obvious desirability of having them able to change their position relative to the main body, it is obvious that the submarines accompanying the slower fleet will have an advantage in ability to regain position, after slight changes of front. If aircraft carriers are to be kept with the main body or are to maintain any definite relative position, it is clear that the slower our fleet is, the greater will be the margin of speed that the carriers have available for flying operations, and the greater will be the number of merchant vessels having the necessary margin of speed to be utilized as carriers.

No student of history can fail to be impressed with the extent to which chance intervenes in battles. The point here is that speed is the most vulnerable of the characteristics of a fighting ship. Hence, when chance intervenes, mobility is the most likely quality to be lost and the fleet which has pinned its faith on speed will probably find the "breaks" of the battle going against it.

Let us examine the hazards to which speed is exposed. First, there are many mechanical casualties which may render this dearly bought characteristic unavailable. If speed is available on the day of battle, the tactical situation may be such that it cannot be utilized. Next, the chance of sudden reversals in course is so increased

as to reduce the likelihood of attaining the desired position. Further, the vulnerability of high-speed ships may result in loss of speed before this characteristic can be utilized. Even if the desired position is attained, the advantage may be nullified or reversed as explained in a previous section. Finally, if everything works out just as the most enthusiastic advocate of speed would wish, it is extremely doubtful if the advantage gained would offset the disadvantage incurred by sacrificing protection. Taken singly, these hazards do not appear serious; together they form a practically insurmountable combination.

On the other hand, protection is built right into the ship, does not get out of order, and is always there when wanted. If the battle is ever allowed to reach the crucial stage, it will be wanted and, other things being equal, will be decisive.

There are still other advantages of protection. Its first cost is less and the maintenance is negligible. No extra personnel is required for its upkeep or operation. This reduces congestion in living spaces. The consciousness of ample protection gives confidence and reduces the mental hazards in battle. Since the speed of other classes of ships is based more or less on that of our battleships, a cut in the speed of the latter makes for more robust qualities all along the line.

Perhaps the greatest advantage of cutting the speed is that it permits a short, beamy hull which is ideal for a fighting ship. The initial stability is increased; better underwater protection can be provided; the gun platform is improved; and the target exposed to gunfire, torpedoes, or bombs is reduced. The resulting smaller turning circle is of value for ramming and general handiness, particularly in avoiding both torpedoes and collisions. On a given weight of armor, this form of hull can be afforded better protection. Similarly, a greater proportion of the space below the protective deck can be devoted to magazines, which room is further augmented by the reduction in size of machinery spaces. Since future ships must carry greatly increased supplies of ammunition, this point is particularly important.

A marked increase in beam has one disadvantage. Such ships could enter neither the existing locks at Panama, nor many of our present dry docks. It will be recalled, however, that a third set of locks at Panama has been under discussion for some time and will eventually have to be provided. If a decision were reached and work started immediately on these locks, they could probably be ready before the ships are. As for the dry docks, there are enough large ones on the East Coast to care for our reduced number of battleships when the fleet is in the Atlantic. On the West Coast, our base facilities are admittedly inadequate. When they are brought up to standard, wide docks will be just as easy to build as narrow ones. Thus the objections disappear, provided prompt action is taken. We should not forget Jellicoe's regrets over having built ships to fit existing docks. (J-315)

The possible value of these ships in combined operations should not be overlooked. Their value in a decisive naval battle is paramount, but this must frequently be followed up by a landing. In a war with a weaker power, such operations might be the only way in which a battle fleet could be actively employed. In the World War, a smashing success at the Dardanelles would have yielded even greater results than a sweeping victory at Jutland. The point here is that, in combined operations, the value of speed is nil, since the ships must anchor for effective firing.

Mahan has expressed himself repeatedly and unmistakably on this issue of speed. Typical of his views is the following:

> The great end of a war fleet, however, is not to chase, nor to fly, but to control the seas. . . . . When speed, not force, is the reliance, destruction may be postponed, but can be escaped only by remaining in port. . . . . Force does not exist for mobility but mobility for force . . . . the time has come to say plainly that its [speed's] value is being exaggerated. . . . . (M-82)

These words were written in 1898, when eighteen knots was a dizzy speed for battleships.

It would be interesting to know what would have been the German answer to the *Rodney* and *Nelson*, had they been allowed to build 35,000-ton battleships. The only clue that we have as to the type they would build is Mr. Bywater's previously quoted report of Krupp's proposed "dreadnought destroyer." The powerful armament, low freeboard, and thick armor specified for these ships are all indicative of low speed.

This is not proof; it is simply offered for what it is worth.

The strategic position of the United States, moreover, differs from that of any other nation. Our fleet might be compelled to fight thousands of miles from any well-equipped base. Seriously damaged ships would probably be lost on the long return trip. The best way to avoid having badly crippled vessels is to cut their speed and increase their armament and protection. Those ships still fit to carry on might have to wait some time before they could replenish their stocks of ammunition and stores. Consequently, generous supplies are of particular importance to us. On the other hand, no naval power has a fleet base within striking distance of our shores. We have, therefore, less to fear from "hit-and-run" raids than other powers and speed is of less value to us. Furthermore, thanks to the sound judgment of the General Board in years gone by, we have the slowest battleships of any of the leading powers and are consequently in the most favorable position to exploit the return swing of the speed pendulum.

Finally, it is in keeping with our naval traditions to strive for the maximum in hitting and resisting power. These traditions, moreover, have something besides sentiment behind them; their soundness has been proved in every test. Let us "hold fast to that which is good."

THE DECISION

We should first review the points previously brought out:

1. The World War demonstrated that the value of speed had been greatly exaggerated and that the requirements for armament, ammunition, and protection have been increased.

2. Post-Jutland developments have not only still further reduced the value of speed, but still further increased the demands for armament, ammunition, and protection.

3. A cut in speed would be advantageous in the operation of fleet submarines and aircraft carriers; it would permit an improved form of hull which allows better protection, provides more space for magazines, increases stability, reduces tactical diameter, makes a better gun platform, and reduces the target exposed to gunfire, bombs or torpedoes; it would also be in accordance with the teachings of Mahan, with our unique strategical requirements and our sound naval traditions.

These points indicate that our problem consists, not in how much we dare increase the speed of battleships, but in how much we dare reduce it in order to meet the increased requirements for armament, ammunition, and protection, as well as to reap to the fullest extent possible the many advantages of such a step. It is, therefore, proposed that we ignore the tactical value of speed to the extent of making the battle speed of the fleet the same as its strategic speed and that for all future construction, this should be fifteen knots. If we go higher, fuel consumption runs up too rapidly; if we go lower, the submarine menace is increased and the strategic potentialities of the fleet are reduced. It is further proposed that the maximum speed of battleships should be only two knots above that of the fleet. The ratio 17:15 is nearly as great as 23:20. Increased battle ranges, moreover, have reduced the likelihood of sudden changes in the tactical situation calling for drastic alterations in formation. In other words, we maintain that the speed of our next battleships should be seventeen knots.

In conclusion, attention is called to the shifted burden of proof. This now rests with the advocates of higher speed, since their pet theories were either exploded in the war or rendered untenable by subsequent developments. If they still call for speed, they should demonstrate exactly what they propose to do with it that would justify the necessary sacrifices.

One View *of our* Enlisted Personnel Problem

By MIDSHIPMAN J. R. HAILE, *U. S. Navy*

IT APPEARS to me that the problem of personnel has been somewhat underestimated, and therefore slighted, by the powers-that-be in the Navy. Officers from each Naval Academy class are sent to take postgraduate courses in technical subjects like ordnance and engineering, but I have yet to hear of any of them being sent to take postgraduate courses in advertising and psychology. The engineers select the very best of metals for the purposes to which they are to be put, but the recruiting agencies are less particular. I do not think that the Navy is getting all that it can out of the men that it has. And on the other hand, I do not think the men are getting everything that the Navy holds out to them. I studied the situation as an enlisted man and I have since tried to get at it from the officer's point of view. The result, I hope, is the mean of the two—the safe course in the middle of the channel.

The solution of the personnel problem, as I see it, bears on the solution of two other problems. The first is the creation from a small peace-time nucleus, of a war-strength Navy which will be worthy of the responsibilities placed upon it in time of war. The Naval Reserve and R.O.T.C., similar to the C.M.T.C. and the R.O.T.C. of the Army, are being tried as possible solutions. But the systems face difficulties in the Navy that are not to be found in the Army. There is less work which requires technical training in the Army than in the Navy.

The second problem is the defense of the Navy against certain destructive outside influences. The motives of the proponents of smaller-navy movements may be the best in the world, but in general, it appears that their ideas are too often blindly idealistic, or impractical. Historical precedents show that it does not pay to be so blinded by enthusiasm for a world-saving idea as to throw discretion to the four winds. A man who has some influence may become so imbued with visions of world peace and universal harmony, that he sets out to establish them at one stroke. To convince the world of his sincerity, he exerts his influence in such a way as to end by cutting an arm or several legs off our Army or Navy. That may be a very effective argument in favor of world peace, but such an argument never won a battle.

Until those countries of the East, where the greater part of the world's undeveloped population and resources are concentrated, have passed through the stages in their development that we are now in, our nation will need its Navy. And, conversely, as long as that is so, our Navy will need the support of the nation. The Navy is more or less helpless in the hands of these outside influences. There is little that can be done directly to combat them. Our voices are drowned in a flood of propaganda and exhortation. But actions are more impressive than words and there is more than one way of accomplishing the desired result. I believe that the Navy can do a great deal towards protecting itself through a solution of its personnel problem.

In years gone by developments in the Navy have been chiefly in material, with just as much technical development in personnel as was deemed necessary to insure a well-trained crew, capable of operating and caring for the highly perfected machines of war. That the present-day sailorman is almost beyond comparison with the old sailing-vessel man-o'-war's man, is undisputed. But that he is any shining example of perfection can be disputed. One has but to live in close contact with him for a short time to see vast room for improvement.

Naval wars of the future, like wars of the past, will be fought out with the elementary things of war, i.e., strategy and tactics, new and old machines, and officers and men. Problems of strategy and tactics and problems in the development of old and newly invented machines are being worked on continually, and with high intelligence. The system of officer selection and development is being improved constantly, and has already reached a high standard. It seems that in the eager research one phase of the big problem is being overlooked.

How about the enlisted man? Is it not as essential to mold a ship's crew out of a high type of recruits as it is to make guns of the best grade of steel? After all, the machine can be no more efficient than the man who operates it. If the Navy's personnel is as highly developed as it can be, then we need a higher type to start on. The technical personnel turned out from the radio schools, machinist's-mates' schools, etc., is highly efficient, considering the type of material with which the officers have to work. The average Navy man is a fairly good machine, he is above average physically, but there is still something lacking. Otherwise, he would be a well-rounded, fully developed, and more valuable man. Take your own idea of the word MAN; put the average member of your crew up in contrast, and see wherein he is lacking. Education, moral code, and ambition will be among the principal defects.

However, the general scale of morals in the enlisted personnel is not low enough to justify the social position assigned to the bluejacket. That the scale is low, is true—from all external appearances. The external appearance is what assigns the position and that social status is having a very definite effect. As I see it, that constitutes a large thorn in the side of the naval service.

The Navy draws its recruits from two sources—the city and the country. By far the larger number come from the country. From these sources there are three general types of men—good, bad, and indifferent. Roughly there are about 10 per cent good, 15 per cent bad, and 75 per cent indifferent.

The good men come from good families, have high-school and sometimes college educations, and join the Navy for some definite purpose. In general, they are quiet, clean, efficient, diligent, intelligent, and conscientious. They are to be seen quite often at divine services and are, if I may say it, the backbone of the ship's organization. Their ratings go through fast; they make good petty officers; they put something into the Navy and get more out of it than the law of compensation commonly provides for. Most of them are to be found in the electrical, radio, or machine divisions, or among the yeomen, storekeepers, quartermasters, and signalmen. Few find their way to the deck divisions. As I said, they come to the Navy for a purpose, and as a result, fill the vocational schools.

The class that I have called indifferent comes largely from the farms; from good, honest, plain, God-fearing, hard-working, inland families. Some one refers to the class as the "backbone of America." It is above the laboring class of the city; it is the least favored group of that great middle class from which the majority of officers come. The average man of this group has finished grammar school and many have had a year or two of high school. The youngsters' (for few of them are more than that) motives for entering the service are: a desire to see the world; distaste for the hard work and close confines of the farm; or a strong indisposition for the educational atmosphere to be found about a school. These men fill the deck divisions, and the firemen's billets in the boiler division or engine-room force. They have no particular ambition save to do as little work as possible, and take ratings as they are offered. They are not over-responsible, have no great strength of character, are easily led and influenced, and, in general, are rather simple. They do hold one deeply rooted idea, and that is that the primary requisite for a sailorman is that he be "hard-boiled"—that is, while they are still young.

To come now to the third class, our recruiting service frequently picks up almost anything that can pass the physical examination and clear the recruiting-office door a sufficient number of jumps ahead of the sheriff. The majority are not of this caliber, but enough are to insure a steady low level in the enlisted personnel's mass character. It is what Admiral Wilson dubbed "the vicious 40 per cent," though the percentage is not that high.

This third type of recruit comes, to a large extent, from the cities; from districts

in the cities where the lowest levels of American society are collected. In the service they constitute an influence which is directly responsible for the existing public opinion of the enlisted man. They lead their less calloused brothers of the second class and develop the idea in their minds that to be a sailor one must be a "tough guy." The unhappy incidents, disorders, and disturbances which have given the bluejacket's uniform a "negative drag" with the public can usually be traced to this group, or to their disciples. The fact that the uniform stands out in a crowd serves to stress such occurrences and stamps them upon the public mind, with the result that the whole service suffers from the actions of a minority. It is this group that introduces, revives, and keeps alive those old service traditions that a recruit on his first liberty must get drunk, tattooed, etc. They keep a detention camp filled with the vilest profanity, the crudest stories, and a most evil atmosphere. The effect is reflected throughout the service and is felt, either directly or indirectly, in the life of every enlisted man. In a majority of cases the men of the second group are led on a downward path by the influence of the third group, the age of the second class rendering them susceptible. There is an attraction for the young in the paths of least resistance; and spare time and money are tools in the hands of the powers of evil.

Officers who come into contact with the second group find them not half so "hard-boiled" and tough as they seem, or would lead one to believe. They are fine fellows at heart, and are really good men through previous home influences. They make good, contented sailormen; the type that stays in the Navy rather than go back to the farm. The Navy caters to them; it encourages reenlistments; there will never be a lack of them, I believe.

What would be the effect of eliminating the third group from the Navy? By all rights they belong to the sheriff; he should have them. With the right influences at the training stations, with a little effort in directing them, the second group could be trained along a course that would lead them up instead of down, and a larger percentage of the high fliers would land in the first group. Personal ambition can take a much better hold in a clean, healthy, vigorous mind than in one clouded with low, immoral thoughts. There comes a time in the life of every first-cruise man when he realizes his own mental and moral deficiencies, and their effect upon him. It acts as a spur to his ambition, providing that has not been stifled by a low plane of thought. If, at this time, he is encouraged and helped in overcoming the inertia piled up in the year or two of drifting, if the momentum he has acquired on the down-grade run is not too great, he can pull out of the slump and the final product is a sailorman of which the Navy might well be proud.

In short, the second group, when once rid of the influence of the third, would start on an upward trend, instead of the present downward one. Then the lowest elements of the second set would show up favorably with the present highest elements.

Of course, those men in the service at present would have an influence over the newcomers, but it could be counteracted. Older men of the second class soon realize the error of their ways. If it were put up to them properly, I believe they would cooperate in such a move for the good of the service. The influence of those left over from the third group would become less marked because they become less of leaders with age. They form a minority and with the odds against them, this Devil's brood wouldn't have a chance.

Furthermore, with this source of bad reputation rooted out, the public's opinion of the uniform would gradually rise. Then, perhaps, the self-respecting enlisted man would not be a social outcast—a man looked down upon by the civilians because some of the thoroughbred reprobates in uniform have given him a poor reputation. The men of the first class are of too strong character to seek the sort of company into which their weaker brothers of the second group are led by members of the third group, or are forced to accept though the effects of loneliness. I know of many cases where nice girls would not go with a man in uniform, when they were more than glad to go with the same fellow in civilian clothes. That reflects discredit on the service, and anything bringing the service into disrepute has a reflection upon all those connected with it, either directly in the case of the sailor, or indirectly in the case of the officer. As long as the uniform is held in that light, it falls short of what can and should be made of it.

The future social status of the bluejacket does not concern us so much as the fact that the question of social position does keep out of the Navy a great many youngsters who would gladly come in were it not for the barriers the uniform sets up against them. It is reasonable to believe that the third group would be replaced by this type of men, which would bring the first group up to 25 per cent of the whole. That is, providing the Navy offered the proper inducements to such a class of men.

By proper inducements I mean an increase in the educational facilities and the erasure of the social barriers now existing. Those two things would provide a strong enough attraction to draw a great many high-school and first- or second-year college men to the Navy who were not financially able to go to, or finish college. A vocational training, supplemented by self-instruction in other subjects, with the aid and supervision of officers and other capable instructors made available aboard each ship, backed by practical experience, travel, and the benefits of many human contacts, if properly advertised, would bring into the Navy thousands of high-class men. I have found out that such is possible through conversations, while on leave as an enlisted man and as a midshipman, with former schoolmates at work, or home from college.

Under the present system, it seems to me that the Navy is passing up good for bad; that the men are not getting out of the Navy all that there is in it in the way of a foundation for a useful life in or out of the Navy; and that the government is supporting a so-called non-productive organization which might be made to serve the dual purpose of protection and education.

It is argued, of course, that such a class of men would not remain in the service and the government would be out the money it took to instruct and develop them, losing their services just at a time when they were becoming of value. It is there that the problem of a war-strength Navy comes in.

What is the mission of the Navy in times of peace? Is it not to prepare for war? What better way is there of obtaining a highly developed, efficient, and effective naval reserve? That we would be out the money of instructing them is true, but at the same time we would be laying the foundations for a war-strength Navy that would do away with the "thirty-day wonders" of the last war.

The question of protection against the political powers enters here. With such a system in force, there would be a steady flow of trained men and good, capable, patriotic citizens turned out of the Navy during peace times, to form an enthusiastic citizenry in favor of a large, live Navy. Four years in the Navy would mean an opportunity for the sons of the middle class of America to acquire an education and fit themselves for a useful life at government expense. Battleships would become floating colleges and any attempt to cut an arm off the Navy would meet with a howl such as would be set up if the doors of all the state colleges and state universities were closed. The Navy's only means of self-protection is to sell itself to, and plant itself in the life of, the American people.

Let me give several examples based upon the suggestion. First, an example of the opportunity that the Navy offers at present. The officer in charge of a recruiting station goes to a high school and addresses the boys to show them the opportunities offered by the Navy. (There are a great number of opportunities; let us pick one that is possible at the present time, if people only realized it.) There is a youngster in the audience who wishes to become a doctor but since his family is large and of only moderate circumstances, it is impossible for him to receive any financial assistance from his parents. A course in medicine is expensive; it is very hard for one to work one's way through. The naval officer tells him that he can enlist in the Navy as a hospital apprentice and go to the pharmacist's-mate's school. There he will learn one side of his profession at first hand. Once out of the school, he will be stationed at a hospital or on a ship where he can continue his education. For his pre-medical subjects, he may take a correspondence course provided by the Navy Department, and be helped along by some capable person (a medical officer). Part of his spare time he can spend studying. Upon enlisting, he may make an allotment which he can increase as he rises in rate. At the end of four years he could take and pass examinations on his pre-medical subjects, and could have saved enough money to pay his tuition for some time. By working on the side while at school, he could graduate

and become a doctor—a self-made one. In the event of war, the Navy would have available a doctor with a first-hand acquaintance with service medical work. That is perfectly possible in the service at the present time—but the men in the service lack the ambition to take advantage of the opportunity, and those on the outside with the necessary ambition know nothing of it, or do not care to enlist because it would mean a drop socially and a number of influences that add nothing to a man's character.

If such a system were in effect in the Navy, even more might be accomplished. It is all possible at present, but the Navy could make the opportunity much more valuable and enticing by providing better instruction and making provision for self-instruction with less inconvenience to the man. Say a young man enlists in the Navy. He has heard of the opportunities offered by the service. He finds that he likes the sea and wants to follow it all his life. He tries for the Naval Academy and fails in his examinations or is too old to enter. What then? He goes to sea and decides to take up quartermasters' work. A course is provided in connection with his work that covers mathematics, astronomy, and in general, the subjects necessary to make him a good practical navigator during his four years in the Navy. In the meantime, he takes side courses in practical deck seamanship, cargo stowage, international law, etc. At the end of four years he is prepared to take and pass an examination for third-mate's papers in the merchant marine. Upon the expiration of his enlistment he enters the merchant service. War comes and the government has available a man capable of running a transport, train ship, or standing watches on the bridge of a man-of-war. The man himself is an advertisement for the Navy when he gets out; he has done well by himself, and is an asset to his country.

The Bureau of Navigation offers the Navy Training Courses, or rating courses which help the enlisted man to prepare himself for a higher rating. These courses are very popular and well-known throughout the service. There are also general academic courses covering subjects such as algebra, physics, English, and chemistry, which are provided to help ambitious individuals in overcoming their educational deficiencies. The existence of these is not so generally known. Then there are more extensive courses covering completely a single technical subject such as piloting, or gas engines. These courses are available to every man in the Navy.

Generally speaking, a thing becomes a necessity and that need will be supplied only when a great enough demand for it has been created. The courses offered by the Bureau of Navigation exceed the requirements of the Navy's personnel in its present state. These courses will improve, become more extensive in the range of subjects covered, and will go deeper into the different subjects in proportion to the demands placed for, and upon, them. For that reason, those offered at present should be advertised and pushed to the limit by the officers and men aboard every ship. When a large number of men are taking full advantage of the courses available, the system will develop more rapidly and in time will build up into a fine, thorough, elementary and advanced educational system. The opportunities offered by such a system would attract a great deal of attention outside the Navy and bring to us good men, where we get bad.

This article is but a suggestion as to the unlimited and undeveloped possibilities of the Navy. It can be made one of the greatest practical educational institutions of the country. It can be an asset in times of peace as well as in times of war. In it can develop a truly efficient naval reserve. Navy stock can be raised a great many points in the eyes of the American people by the elimination of a certain group of men through more selective recruiting, advertising among a higher group, and making something to advertise about. There is no radical, revolutionary change involved; it is merely a case of developing the opportunities that already exist and making them more available.

Perfection comes not from without, but from within. A man who is a part of an institution, and who does not do his utmost to make of that institution all that it is capable of being, is failing in his duty. The Navy, in peace and in war, will be just what its officers and men make it. Its possibilities are great, and on the men who develop those possibilities will be reflected greatness. Theirs will be the highest reward for a life spent in a worthy cause—the service of their country.

Courtesy Captain Waldo Evans, U.S. Navy

ST. THOMAS, V. I., AND THE HARBOR FROM THE AIR—TAKEN AT 1,000 FEET ELEVATION

Courtesy Captain Waldo Evans ,U.S. Navy

ST. THOMAS FROM HASSELL ISLAND

Courtesy Captain Waldo Evans ,U.S. Navy

ST. THOMAS FROM HASSELL ISLAND

Courtesy Captain Waldo Evans, U.S. Navy

NAVY BUILDING

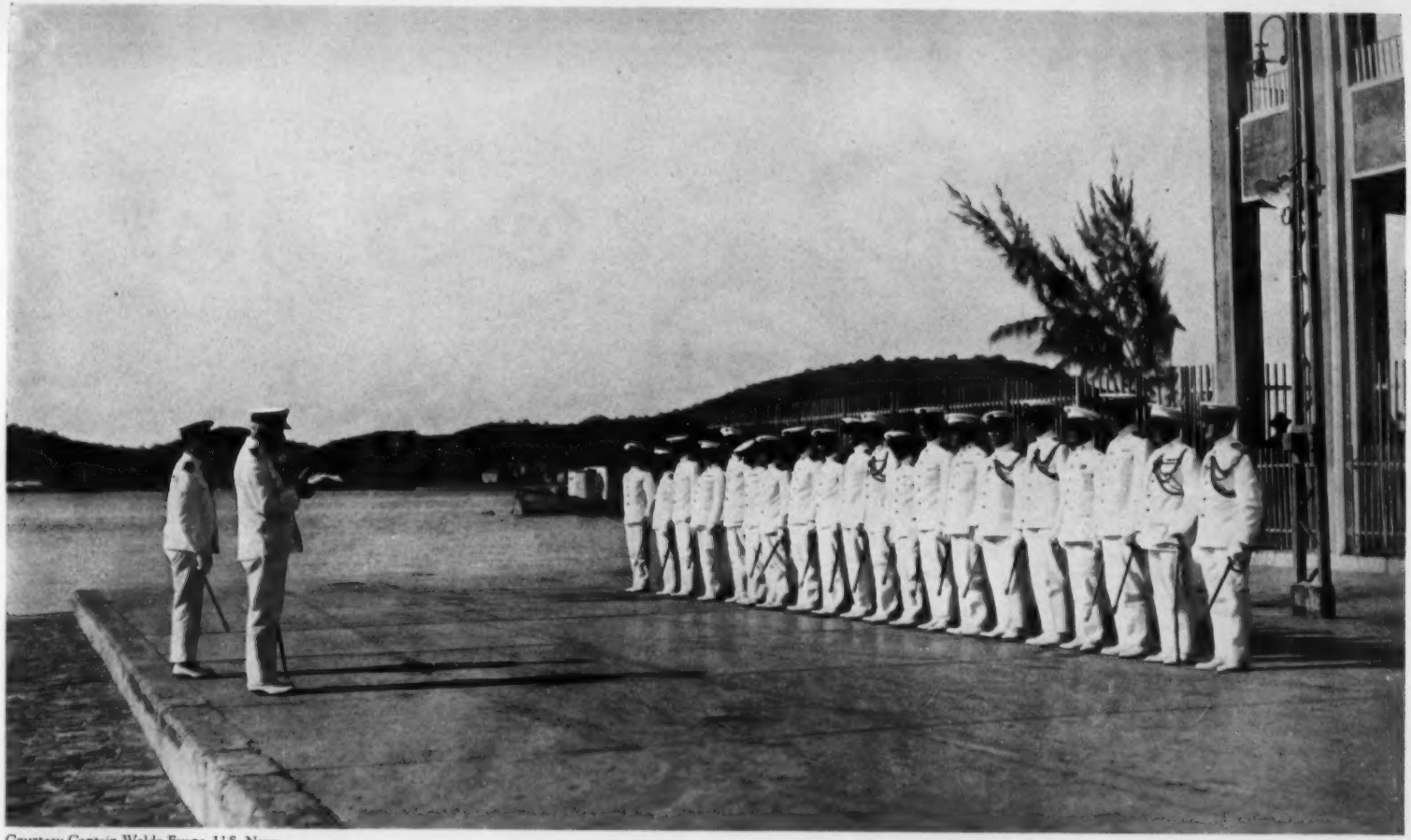
The Navy building before the war was the Hamburg American office building.

Courtesy Captain Waldo Evans, U.S. Navy

PART OF THE FLEET AT ANCHOR IN ST. THOMAS HARBOR

Courtesy Captain Waldo Evans, U.S. Navy

PART OF THE FLEET AT ANCHOR IN ST. THOMAS HARBOR



Courtesy Captain Waldo Evans, U.S. Navy

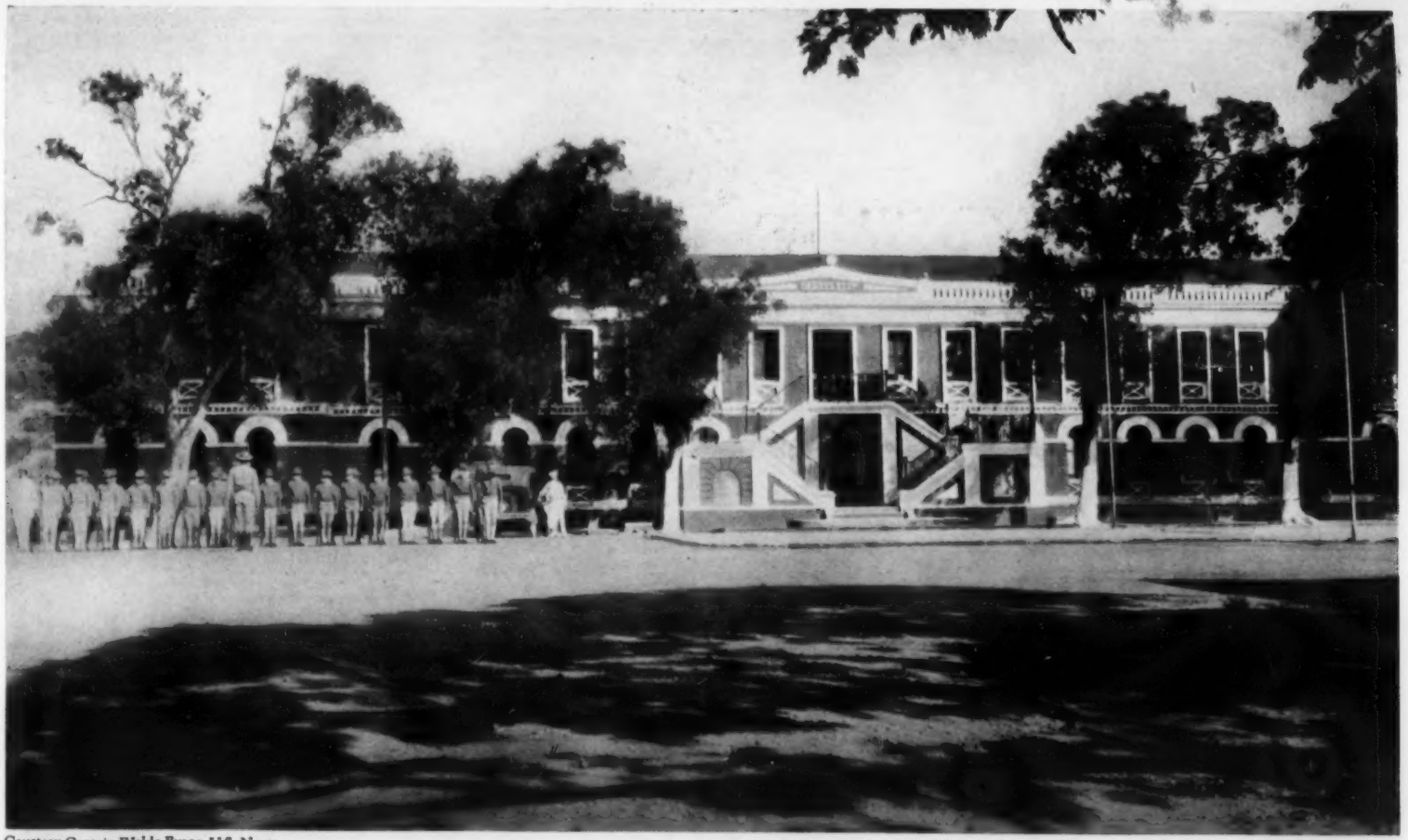
CAPTAIN WALDO EVANS ASSUMING COMMAND OF THE NAVAL STATION

Courtesy Captain Waldo Evans, U.S. Navy

NAVY YARD, ST. THOMAS, FROM HASSELL ISLAND

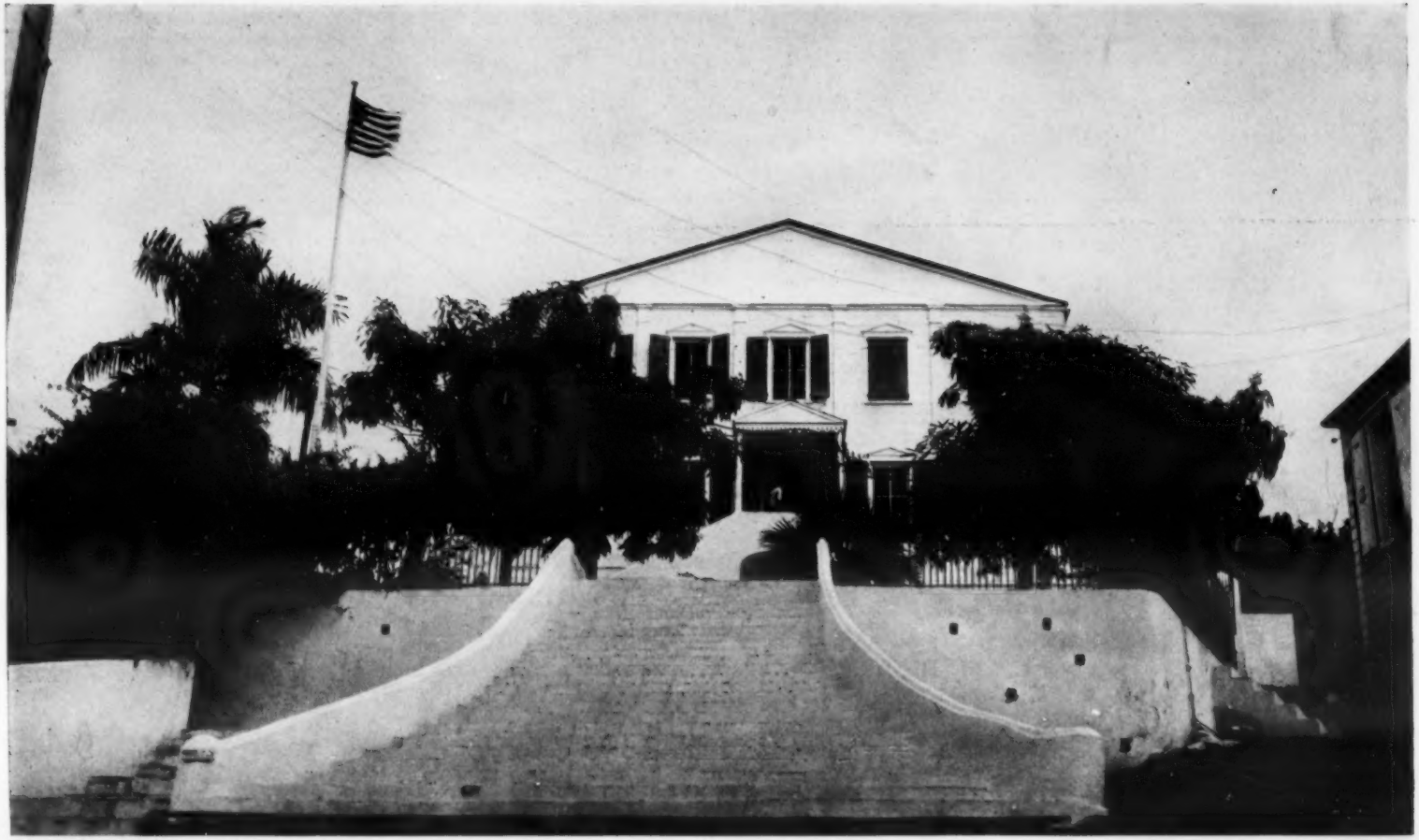
Courtesy Captain Waldo Evans, U.S. Navy

NAVY YARD, ST. THOMAS, FROM HASSELL ISLAND



Courtesy Captain Waldo Evans, U.S. Navy

MARINE BARRACKS, ST. THOMAS, V. I.



Courtesy Captain Waldo Evans, U.S. Navy

U.S. NAVAL HOSPITAL, ST. THOMAS, V. I.

U.S. NAVAL HOSPITAL, ST. THOMAS, V. I.

Courtesy Captain Waldo Evans, U.S. Navy

HOW THE NAVY HELPS MAINTAIN HEALTH IN THE SCHOOLS OF THE VIRGIN ISLANDS

Courtesy Captain Waldo Evans, U.S. Navy

GOVERNMENT HOUSE, CHRISTIANSTED, ST. CROIX

The lower floor contains the government offices, and the upper floors are the governor's residence when in St. Croix.

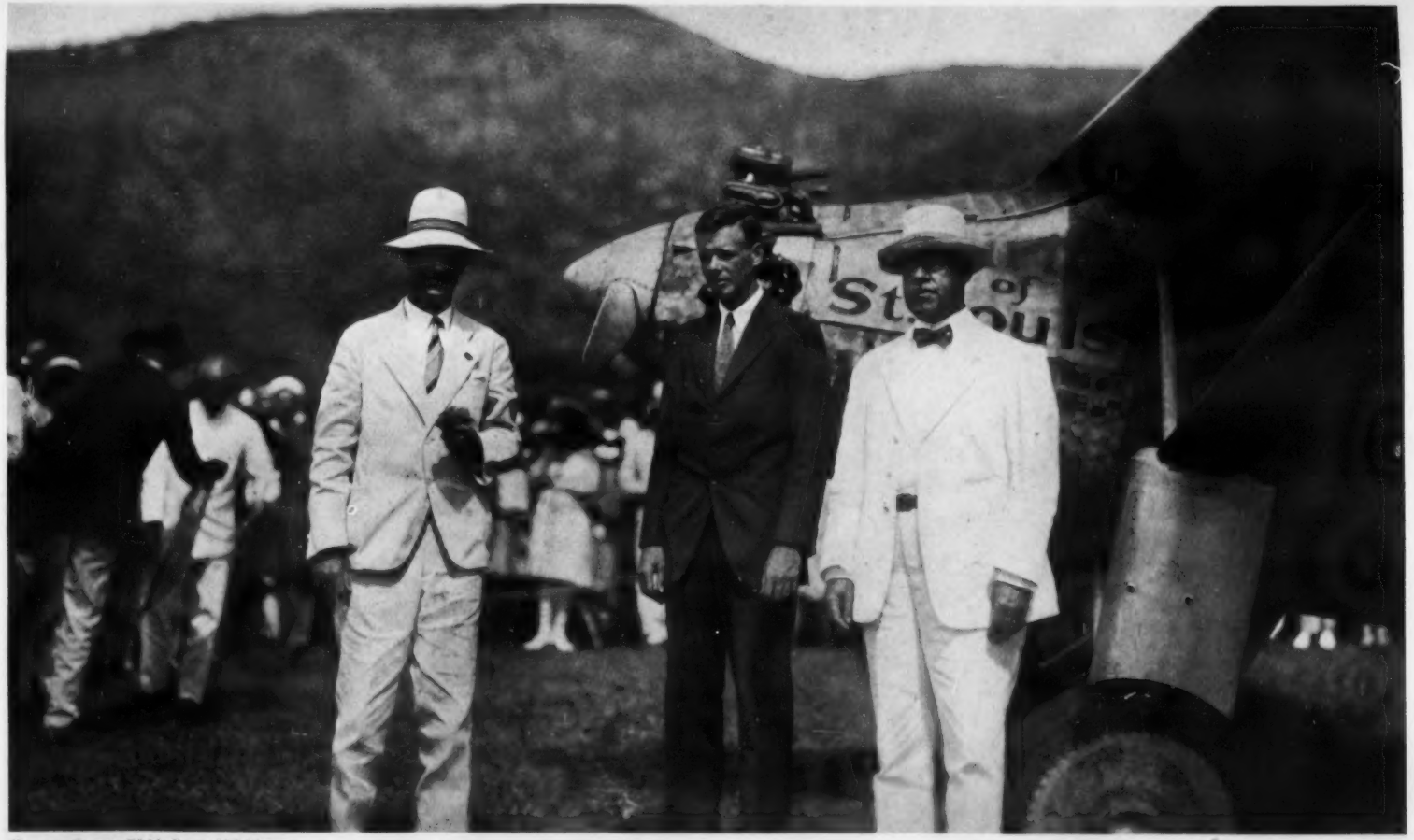
The lower floor contains the government offices, and the upper floors are the governor's residence when in St. Croix.

Courtesy Captain Waldo Evans, U.S. Navy

THE EASTERN PART OF CHRISTIANSTED, ST. CROIX
Showing the old fort. Taken from Protestant City.

Courtesy Captain Waldo Evans, U.S. Navy

U.S.S. *GREBE*, CHRISTIANSTED HARBOR



Courtesy Captain Waldo Evans, U.S. Navy

THE GOVERNOR AND GOVERNMENT SECRETARY WITH COLONEL LINDBERGH, FEBRUARY 2, 1928
One of the stops made by the "Lone Eagle" on his Pan-American flight.

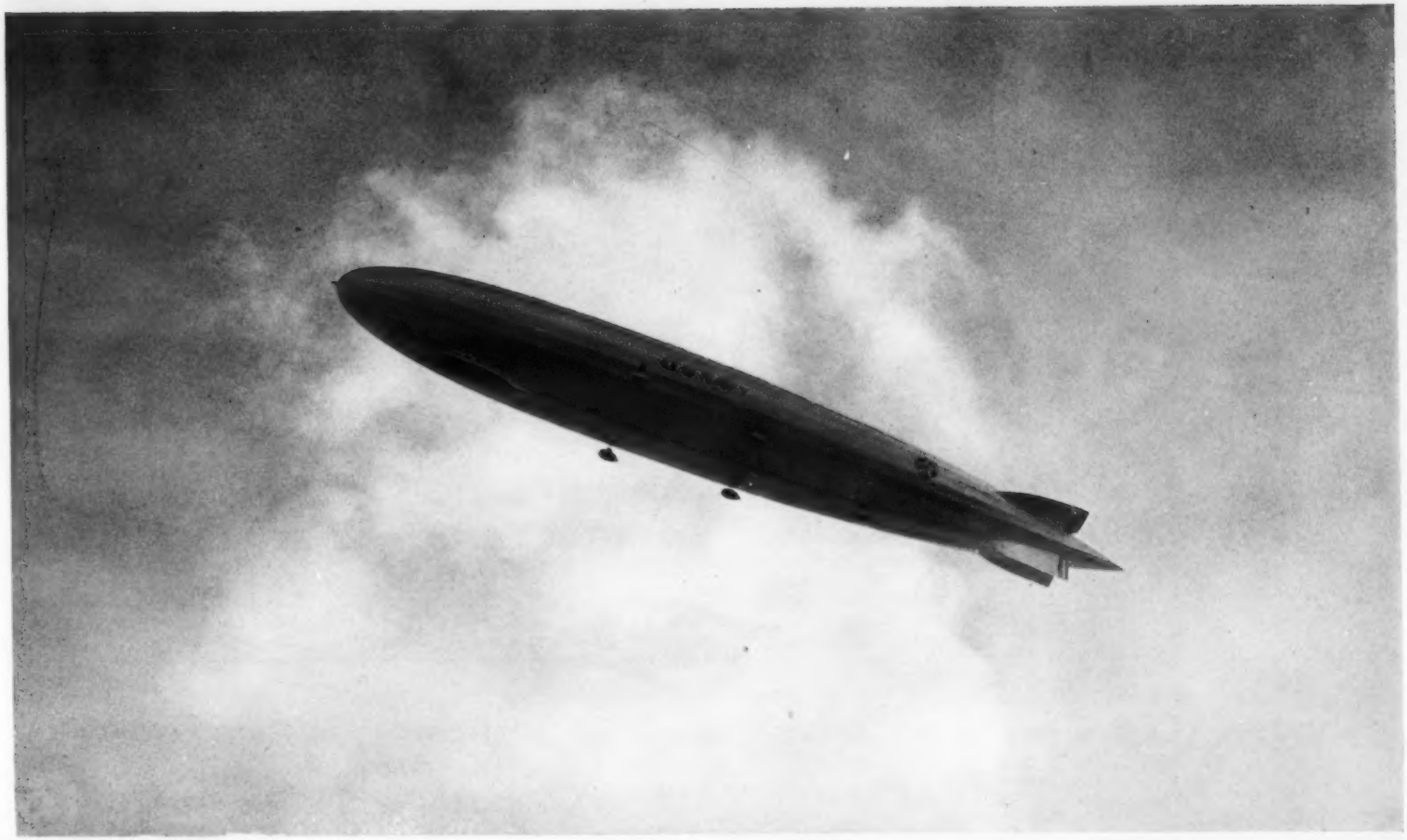
Courtesy Captain Waldo Evans, U.S. Navy

A VIEW FROM VILLA OLGA
Showing a ship on Creque's Marine Railway.

A VIEW FROM VILLA POOR
Showing a ship on Creque's Marine Railway.

Courtesy Captain Waldo Evans, U.S. Navy

BAY TREES, ST. JOHN
The bay rum industry made St. Thomas famous long before Milwaukee aspired to fame.



Courtesy Captain Waldo Evans, U.S. Navy

U.S.S. *LOS ANGELES* OVER ST. THOMAS

The Virgin Islands *of the* United States

By Lieutenant Commander W. L. Thompson (ChC), *U. S. Navy*

U.S.S. LOS ANGELES OVER ST. THOMAS

History

FOR MANY years it has been the boast of the British people that the sun never sets upon the British flag. Since March 31, 1917, the same can be truthfully said of the flag of the United States of America, for the Virgin Islands lie just half way around the world from the Philippine Islands. As the sun sinks from the view of the inhabitants of the Western Philippines it is rising upon those of the Virgin Islands, and it does not pass over more beautiful semi-tropical islands anywhere in its circuit.

Standing on the crest of the hills on the island of St. Thomas, the island of St. Croix is seen rising from the sea forty miles to the southward, itself one of the Virgin Islands of the United States and the place from which came Alexander Hamilton, the greatest figure, aside from Washington, in the American Revolution and the early history of our country. Today you can see in the town of Christiansted the store where he worked as a youth, until he left St. Croix for the American Colonies, and on a hillside at Estate Grange can be found the grave of his mother, Rachel Levine, marked by a granite monument erected by Gertrude Atherton, author of *The Conqueror*. Life in St. Croix, though under a different flag, still is much the same as she pictures it in the story of Hamilton's early life.

Turning to the northeast one may see the island of Jost Van Dyke, one of the British Virgin Islands, upon which was born Dr. William Thornton, the designer of the Capitol at Washington; and Tortola, seat of government of the British Virgin Islands, the home of Dr. Thornton at the time he succeeded in winning the award.

It is also of interest to note that "Dead Man's Chest," the island that inspired the chanty, "Yo, ho, ho, and a bottle of rum, Fifteen men on a dead man's chest," by Robert Louis Stevenson, is one of the Virgin Islands, not of the United States but of Great Britain, and only about four miles from St. John, one of our islands. Around these islands cluster many traditions of the pirates of the Caribbean.

Discovery by Columbus.—The Virgin Island group, about equally divided between the United States and Great Britain, was discovered by Christopher Columbus in 1493 on his second voyage and named by him "St. Ursula and the Eleven Thousand Virgins." He actually landed, on November 14, on the island of St. Croix (politically but not geographically one of the Virgin group) which he named Santa Cruz, which name it still bears on the tongues of many of its inhabitants, who prefer the Spanish form to the French. He found that island, and also the island of St. Thomas, populated with Carib Indians, a race known to have been fierce warriors and courageous travelers among the islands of the West Indies. Articles have been found among their remains indicating that they had intercourse with Jamaica, Porto Rico, Santo Domingo, and Cuba. Some of their carvings can still be seen on the rocks of St. John. It is very probable that St. Thomas was the island Columbus named St. Ursula, as that, he records, was the largest of the group. While this is a matter difficult to determine, it would have been the largest island appearing on the course from St. Croix and probably actually the largest. The Indians were driven out of the Virgin Islands about 1555 by the Spanish, after the Emperor Charles V had ordered that they be exterminated as enemies because of their repeated raids upon Porto Rico. They were either killed, driven out, or enslaved to work the mines of Hispaniola.

Settlement of the islands.—Danish, English, Dutch, and French settlers came to the Virgin Islands during the seventeenth century, the first mentioned settlement being made on the island of St. Croix in 1625,

the first recorded settlement on St. Thomas in 1666, and upon St. John in 1684. At the time these settlements were made there were no Indian inhabitants in the islands, and when Sir Walter Raleigh touched at the island of St. Croix in 1587 there was no indication of any inhabitants.

St. Croix under the English and Spanish.—The settlement upon the island of St. Croix seems to have been made by the Dutch, English, and French jointly. In 1645, war broke out between the Dutch and the English colonists and after a bitter struggle the Dutch departed for other West Indian Islands. The French, who had been sympathizers with the Dutch, accompanied them. For about five years the British had sole possession of St. Croix. In 1650 the Spanish governor of Porto Rico sent an expedition to attack them and many of the inhabitants were killed and St. Croix was claimed for Spain. This unsettled condition aroused hope among the Dutch and French which caused them to attempt to regain the island but they were defeated and driven off by the Spanish.

St. Croix under the French.—It was as a result of this and other aggressions in the West Indies by the Spanish that Cromwell declared war on Spain and, in 1665, took Jamaica. A later expedition of the French succeeded in capturing St. Croix. France then sent out a governor and made an attempt to colonize the island. In 1651 France sold St. Croix, among other islands, to the Knights of Malta and in 1653 they took possession of it to hold it for the crown and for the conversion of the West Indies to the Catholic religion. In 1665 the French West Indian Company purchased the rights of the Knights of Malta and held the island until 1674, when King Louis XIV took over St. Croix as part of the crown dominion. However, colonization was not the success that France had hoped and it was a source of more trouble and expense than it was worth. So, in 1695, France abandoned the island, burning all of the houses, destroying the harbor works, and compelling the planters to remove to other islands. France, however, continued to lay technical claim to the island.

St. Croix comes under the Danes.—In 1725 there was a rumor that the British intended to occupy it and negotiations were opened by which, in 1733, France sold St. Croix to the Danish West India and Guinea Company. In 1734 the governor of St. Thomas was named governor of St. Croix as well as of St. Thomas and St. John, and was directed to take over its government. From this time the history of St. Croix can be treated with the history of the other Danish West Indies.

Early history of St. Thomas.—While the first recorded settlement on St. Thomas was in 1666, it is certain that there was a settlement prior to that time, for, in 1647, French settlers from Crab Island (Viequez—now belonging to Porto Rico), having been driven out by the Spanish, touched at St. Thomas and remained there five days, finding abandoned fruit groves and evidences of former cultivation. It may be supposed, since St. Thomas is within sight and easy sailing distance of St. Croix, that some of the inhabitants of St. Croix, or the Dutch buccaneers who later settled in the present Dutch West Indies, temporarily settled in St. Thomas.

The colony that existed in St. Thomas in 1666 was not there earlier than 1657, as the island was uninhabited at that date, and when St. Thomas, St. Martin, and St. Eustatius were captured by the British in 1667 all the colonists were removed by the British from St. Thomas to the other islands, which were considered more fertile and were already better populated.

St. Thomas settled by the Danes.—As the island of St. Thomas was now abandoned by the British, the Danish West India and Guinea Company established a trading post upon it and claimed it in 1667. The protests of Britain were ignored, and as she took no other measures to enforce her claims, the island became Danish territory.

In 1671 Denmark sent out the *Golden Crown* and another ship from Copenhagen, bringing a governor, Jorgen Iverson, and colonists. The governor immediately commenced building a fort at the port that was later known as "Charlotte Amelie" and is now the town of St. Thomas. This fort, with some later additions, is the old Fort Christian.

Extension of Danish territory.—Shortly after this the Danes also claimed Viequez or Crab Island but the Spaniards captured this in 1682. The sovereignty of Denmark was extended over the whole of St. John in 1684 by Governor Iverson, who caused

it to be settled by Danish planters and slaves. Near this island were numerous small islands or cays which naturally came under the same rule and so in 1733 the Danish West Indies had reached the limit of their final expansion.

Slave insurrection in St. John—In 1733 the white colonists upon St. John were brutally murdered (with the exception of a few planters who escaped to St. Thomas) by the slaves, who were aroused by the extremely cruel discipline imposed upon them by an ordinance issued by the royal council in January of that year. After seeking aid from a vessel of Nevis, and also from the French in Martinique, and after the island had been in the possession of the slaves for six months, the forces raised against them became so great that practically all the slaves committed suicide, jumping over a cliff at Brim's Bay rather than surrender. Several slave insurrections took place at various times in St. Croix, but none that was not readily quelled until the one that many years later resulted in the emancipation of all slaves in these islands.

European wars involve the islands.—In 1800 Denmark, because she was not strong enough to preserve her neutrality in the struggles between England and France, became involved in a war with England, and on April 1, 1801, St. Thomas surrendered to Colonel Cowell (whose name is still preserved in the name of the fortifications where the present signal station is located). The island was held by Great Britain until February 22, 1802, and on that date restored to Denmark. On December 22, 1807, these islands were again captured by Great Britain and continued under her rule until April 15, 1815, when Great Britain restored them again to Denmark in exchange for the Danish island of Heligoland.

The eyes of the United States are turned upon St. Thomas.—During our Civil War the need of a naval station in the West Indies was apparent. If there had been one the war might have been shortened considerably. When the war was concluded an attempt was made by the United States to secure such a base. The Danish West Indies were most favored, partly because of the splendid harbor of St. Thomas, and partly because it was felt that Denmark, on account of her great financial losses in war, would be willing to sell. Secretary Seward secured a survey of the islands in 1866 and also visited them.

In October, 1867, a treaty was negotiated for the purchase of St. Thomas and St. John for $7,500,000, subject to the consent of the Danish Landsthing (Upper House or Senate) and the Senate of the United States. A vote of the inhabitants on this transfer favored it (being 1,244 to 22). As a result the Danish legislative body ratified the treaty and on November 27, 1867, the King of Denmark issued a proclamation informing the inhabitants of the sale. But because of enmity between the Senate leader, Sumner, and the President of the United States, the treaty was not ratified by the Senate, and on April 14, 1870, it lapsed. The King of Denmark also issued a dignified proclamation to that effect on May 7, 1870.

Our second attempt to purchase the islands.—Again during the Spanish-American War the same need of a West Indian naval base was noted and another treaty was negotiated (in January, 1902) for the sale of these islands to the United States for $5,000,000. This treaty was ratified by the United States Senate and the Folkthing (Lower House) of Denmark but it failed of ratification in the Danish Upper House.

The purchase of the Virgin Islands.—The matter remained thus, though there were attempts to renew interest in it during 1911 and 1912, until in 1916 another treaty was negotiated for the purchase of these islands. After a popular vote of the Danish people and since the inhabitants of the islands themselves were in favor of the sale, Mr. Lansing, then Secretary of State, and Minister Brun of Denmark exchanged the ratifications of the treaty, transferring the islands to the United States for the sum of $25,000,000, on January 7, 1917. On January 25, 1917, the President of the United States issued a proclamation setting forth the treaty in full and on March 9, 1917, the King of Denmark issued a proclamation announcing the sale.

Arrangements for transfer and government.—On March 3, 1917, the Sixty-fourth Congress by Public Bill No. 389 provided for the temporary government of these islands by providing that all military, civil, and judicial powers should be vested in a governor whom the President might appoint until such time as Congress should

provide for the government of the islands, and further providing that the President might assign an officer of the Army or the Navy to serve as governor.

In pursuance of this act of Congress the President of the United States placed the government of the Virgin Islands under the Navy Department, sending Commander Edwin T. Pollock, U. S. Navy, as acting governor, to take over the islands, and appointing Rear Admiral James H. Oliver, U. S. Navy, as governor. The governor of the Virgin Islands since the transfer has always been a naval officer, not only ordered to duty in the Virgin Islands by the Navy Department, but also specially commissioned by the President of the United States as governor. In pursuance of the treaty, on March 31, 1917, the Danish flag was hauled down and the American Stars and Stripes took its place; the Danish West Indies became a memory and the Virgin Islands of the United States were born.

It is of interest to know, also, that there had been several insurrections of slaves, resulting in the abolition of slavery in the Danish West Indies in 1848, fifteen years before the Emancipation Proclamation was issued in the United States, and that most of the native inhabitants of the Virgin Islands are descendants of the former slaves.

DESCRIPTION

The Virgin Islands of the United States, consisting of the islands of St. Thomas, St. Croix, and St. John, together with their numerous tributary isles or cays, are semi-tropical in climate, lying between 64° 30′ and 65° 10′ west longitude and 17° 30′ and 18° 30′ north latitude, forty miles east of Porto Rico, from which they differ, however, in having a drier and more equable climate, seldom showing more than a nine-degree daily variation and practically never more than a twenty-degree annual variation in temperature. The extreme ranges noted over many years were between sixty-seven degrees and ninety-one degrees. The rainfall averages about forty-seven inches a year. On account of these conditions the Virgin Islands are ideal as a winter resort and they are also, largely because of the American control of sanitation and health, probably the most attractive islands in the tropics from a health standpoint.

Flora.—Owing to the lack of rainfall the flora of the islands is not typically tropical. Cocoanut palms exist in small numbers, as do the cabbage palms, royal palms, mangoes, papayas, mameys, and guavas. Bananas of several types are grown plentifully and some plantains are cultivated. Pineapples are grown, but only in limited numbers. Almost all vegetables that will grow in temperate zones do well in the Virgin Islands, except Irish potatoes, cabbage, and head lettuce. Leaf lettuce is grown. Okra grows wild. Pigeon peas and black-eyed peas are raised more extensively than ordinary garden peas. String and lima beans do well. Tomatoes, egg plant, peppers, and Bermuda onions are easily grown. Sweet potatoes, yams, cassava, and a species of dasheen or tania furnish the starchy root vegetables of the people.

Industry.—St. Croix is largely devoted to the production of sugar cane, until recent years sugar being its only export. Now, however, cattle raising has been developed into a profitable industry, and also the growing of vegetables for the United States market during the season when they bring the highest prices.

But the day of sugar cane in St. Croix seems to be drawing to a close because it does not have rainfall enough to compete with countries where the yield is greater and the cost, as a result, lower. Also the competition of the beet-sugar industry, which is not dependent upon tropical conditions for its existence, has resulted in a price that is often below the cost of raising sugar in St. Croix. It is, therefore, probable that the future of St. Croix agriculturally (and it is to agriculture that St. Croix must look for its means of existence) will depend on a much wider diversification of crops. The government is experimenting, demonstrating, and encouraging planters there to diversify.

St. Thomas and St. John, because of their rocky, precipitous formation, are not so desirable from an agricultural standpoint, although, at the present time, under the encouragement of the government, vegetables are being grown in considerable quantities both for shipping and for local consumption. St. John is noted as being the producer of the finest bay oil in the world, and one of the principal industries of St. Thomas, for which it has been noted for many years, is the manufacture of bay rum.

Its bay rum is known all over the world as the finest that can be produced.

Most of the experiments with the raising of vegetables for export to the United States have been conducted with tomatoes, egg plants, peppers, and Bermuda onions. While rainfall throughout the year is not great enough or reliable enough for the best growth of cane, there is usually sufficient rain during the months of September, October, November, and December to produce vegetables for the market at a time when they meet the least competition and thus bring the best prices in New York.

The principal newer industry in St. Thomas is the shark-fishing plant of the United States By-Products Corporation, located on Red Hook Bay near the southeastern corner of the island. A complete plant has been built and equipped with boats, nets, etc., for catching, skinning, and preparing the shark skin for leather, rendering the liver oil which is in great demand (and is supposed to be of greater value than cod liver oil for the same purposes), making meal (used for chicken feed and fertilizer) of the dried flesh and bones, and drying the fins for export to China. While it is not known yet whether the difficulties of catching sharks may be such that this will not develop into a large industry, it bids fair to be a profitable one, giving employment to a considerable number of men. There is an ever increasing demand for shark leather.

St. Thomas Harbor.—However, the principal asset of St. Thomas is, and has always been, its splendid harbor, and because of this, the finest harbor in all the West Indies, it has ever been primarily a commercial and coaling port. Until 1924 the only dry dock in this part of the world, except a French dock at Martinique, was located here. This dock sank and has not yet been replaced. This should, and probably will, be done as soon as possible. There is a marine railway slip however, which can care for smaller vessels.

St. Thomas is yet, however, the most convenient coaling point for ships bound from the Canal to Europe and vice versa. Fuel oil also is always ready and every effort is made to receive and dispatch ships with the least delay possible. The Danish West India or St. Thomas Coaling Company can coal by crane and hand at the rate of 200 tons per hour. As a rule this machine coaling is done only when a ship desires more than 300 tons. Otherwise the coaling is done by hand labor at the rate of about 100 to 125 tons per hour. For this the coal carriers get two cents for an eighty-pound basket.

The number of ships touching at St. Thomas and their tonnage is constantly increasing. The harbor department figures for the past three fiscal years are as follows:

Fiscal year	*No. ships*	*Tonnage*
1925	428	1,472,242
1926	432	1,657,213
1927	429	1,711,163

For the first half of the fiscal year 1928 there was a considerable increase over the year 1927. These figures do not include interisland ships of less than 100 tons.

The United States Navy keeps a mine sweeper (U. S. S. *Grebe*) stationed at St. Thomas for interisland communication. This is the only tug available for rescue work nearer than Havana or Key West, for ships in distress or aground. Last year the *Grebe* was called upon to float the Cunard liner *Franconia,* aground in San Juan harbor, Porto Rico. A short time ago she answered a call for help and towed in the American barkentine *E. R. Sterling,* 183 days out of Sydney, Australia, which had been dismasted twice in a voyage around the Horn and was drifting into dangerous waters.

Throughout the winter season numerous tourist ships on their West Indian and South American cruises visit St. Thomas, for its delightful climate and interesting historical features. Three regular lines of passenger steamers—the Furness-Withy Line from New York to Trinidad, the Ocean Dominion Line from New York to Dutch Guiana, and the Danish Line from Copenhagen to San Francisco via the Canal—touch St. Thomas on monthly schedule or oftener. The Bull Insular Line from St. Croix via St. Thomas and San Juan to Santo Domingo touches weekly, connecting at San Juan with weekly sailings of the New York and Porto Rico Line and the Red D Line to or from New York. The Hamburg-American Line has just reëstablished a line from Germany to the Pacific coast via St. Thomas and the Canal, and all indications are that the business of the harbor will continue to grow.

There are two hotels in St. Thomas, but they are not equal to present demands. Plans are underway for the erection of a large tourist hotel which should result in an influx of desirable visitors during the winter and spring.

GOVERNMENT

The government of the Virgin Islands has several peculiarities. It must be remembered that we received from the Danes a going government and that only such changes rendered necessary by the changed sovereignty were at first made. Congress has been hesitant about making any radical changes since. The Constitution of the United States does not apply and only such laws of the United States are in force as are specifically extended by Congress.

The islands are organized into two separate municipalities, "The Municipality of St. Thomas and St. John" and "The Municipality of St. Croix." They have separate colonial councils or legislative bodies, separate codes of laws, and separate budgets. They are united in that the governor and certain general administrative departments work to some extent in both municipalities. In other ways they are as different as two foreign countries, or it might be better to say as two separate states of the United States. This was a situation that we inherited. The governor, as stated before, is a naval officer. Some of the heads of the departments are naval and marine officers, and some civilians. The government is not, however, as are those of Guam and American Samoa, a naval or military government. It more nearly approximates the type of government in Porto Rico, where the governor is appointed by the President, but a large measure of self-government is left to the inhabitants. Early in 1928 President Coolidge signed a bill making the Virgin Islanders American citizens. The day that the news arrived was a day of rejoicing.

The colonial councils are partly elective and partly appointive. Their acts or laws are, of course, subject to veto by the governor or the President, but are otherwise only limited by laws passed by Congress. Civil courts function with appeal to the U. S. District Court of Appeals in Philadelphia. The military activities are strictly separated from the civil, and the senior naval officer and the senior governmental officer under the governor are separate officials, though both are naval officers, and interfere in no way with each other. In the absence of the governor-commandant, one becomes acting governor and the other acting commandant. The policing is all done by civil forces who are under the control of a civilian director of police in each island.

Points of Interest.—In St. Thomas are found many interesting places. On Luchetti's Hill stands an old stone tower known to the world as Blue Beard's Castle, which is reputed to have been the stronghold of the pirate of many wives. A legend says that this castle and Black Beard's Castle on Government Hill were at one time connected by underground passages. It is probable, however, that this castle was built by the Danish government as a fort in 1700 and later passed into private hands. Whether this actually included tenancy by pirates is not a matter of historical record, but quite a legend has grown up around it.

Black Beard's Castle, located on Government Hill, is another old tower which has an interesting history. It is reputed to have been the stronghold of the pirate, John Teach, otherwise known as Black Beard. While it is not known whether Blue Beard was a real or legendary character, it is certainly true that Black Beard was a pirate who roamed the Caribbean for many years. Whether he actually occupied the castle is not known, but as St. Thomas was the great mart of the Caribbean he must certainly have entered its harbor and walked its streets. History is meager but it indicates that one Carl Baggaert built the castle in 1674 and that it was later occupied by the Danish government because it overlooked Fort Christian. Later it again passed into private hands.

The old Fort Christian, at the landing on the harbor front, was the first official building of the Danish government, having been started in 1671 and completed the following year. In it the governor had his residence and in it also lived the Lutheran clergyman, minister of the state church of Denmark. Here he conducted his church services for the soldiers and colonists for many years. This old fort is no longer used as a military stronghold, but is now the seat of the courts, police department and jail of St. Thomas.

Very early in the history of the Danish

West Indies the Moravian missionaries began work with the colored or slave population and the old missions of Nisky and New Hernhut in St. Thomas, Emmaus in St. John, and Friedenthal in St. Croix are the sites of the beginning of this work. Other old churches are the Reformed Dutch Church and the Memorial Moravian Church in St. Thomas, and the Moravian, Anglican, and Catholic Churches in Christiansted.

Many years ago, to these West Indian islands came numbers of Huguenots, fleeing from persecution in France, and while most of their descendants are now Catholic, they still remain. They have almost entirely maintained their own identity by intermarriage and remain unmixed with the surrounding native or colored population. These people make up two considerable communities in St. Thomas, the smaller one in the hills devoted to agriculture, and the larger one on the bay to the west of the town of St. Thomas to fishing. These Cha-Chas, as they are known, are also skilled in weaving hats and baskets of various types.

Recreational facilities.—Among the diversions are golf, tennis, bathing, and horseback riding. The St. Thomas Country Club has a splendid nine-hole golf course. The St. Thomas Tennis Club has courts available for the use not only of members, but of visitors. Fish of all kinds, particularly kingfish, barracuda, Spanish mackerel, tarpon, and yellowtail, abound in the waters surrounding St. Thomas and St. John. The Deep Sea Fishing Club has a clubhouse for a limited number of visitors. The fishing is best at the eastern end of St. Thomas or west of St. John among the numerous cays. Splendid swimming can be found at John Brewer's Bay and Mosquito Bay on the south side of St. Thomas, or, if open-sea bathing is desired, at East Point, Smith's Bay, or Magen's Bay on the north side of the island. Trails are numerous over the island of St. Thomas, reaching many places otherwise inaccessible, and horseback riding furnishes an interesting means of passing the time. The views obtained from Mr. Fairchild's villa, Louisenhoj, on the crest above St. Thomas, or at Mafolie, Crown, or west toward Botany Bay, are as beautiful as can be found anywhere.

St. John is not so well developed, having only about 975 people, and all travel is by horseback or boat, but it is well worth a visit by anyone coming to the Virgin Islands.

St. Croix, on the other hand, is an island of beautiful drives, being largely of level land. The drive from Frederiksted to Christiansted (the two towns on the island) leads through the fields of cane, past the beautiful homes of planters, the great Bethlehem sugar factory, and through Estate Grange where the tomb of Alexander Hamilton's mother can be seen on the hillside south of the road, and gives one a splendid idea of the life of the people. Fishing for longusta (a species of large clawless lobster) on the reef, hunting deer, which are plentiful, and shooting doves, are the principal diversions of St. Croix.

The Future of the Virgin Islands

The future of these islands lies in two directions. One is the development of diversified agriculture, principally truck farming and cattle raising, which is very easily possible in St. Croix, and can be developed to a certain extent in St. Thomas and St. John. The other is the development of a large tourist hotel and the advertisement of these islands as one of the most delightful all-year-round resorts that it is possible to find. The climate is never cold and yet it never becomes too warm for comfort, because there is no time in the year when the cooling winds, generally from the Atlantic Ocean to the northeast, do not blow. A temperature never rising above ninety-one degrees is always comfortable, and the rainfall is not, as is usual in the tropics, great enough to cause serious inconvenience. The government of the Virgin Islands is working steadily to develop interest in both these projects and to demonstrate their feasibility, as well as to build up the commerce of the harbor of St. Thomas.

Another possibility would be the development of a sanitarium, for which, on account of the delightful climate and generally healthful conditions, no better place could be found. For many years physicians, both those stationed here and those visiting the islands, have been unstinted in their praise of the islands for that purpose.

What the future holds no one can say with certainty, but it is very probable that the next few years will demonstrate the success of these efforts and the Virgin Islands will again be the prosperous and happy places they have been in the years gone by.

The Line Task : Command

By Lieutenant Commander Alfred Tawresey, *U. S. Navy*

OPPOSITION to the traditional policy of insisting upon broad, general development of the officer personnel, as against any form of specialization, has been constant. Although those responsible for the policy have not wavered, exceptions have crept in, and there is a lack of appreciation of the reasons for the policy. It is the purpose of this discussion to focus attention on the causes which make non-specialization the only sound line policy, and to suggest means by which correct development can be furthered.

The Art of Command

It is ever true that "Men fight, not ships." In order to fight effectively, men must be directed properly. Proper direction is the art of command. The art of command may be defined, otherwise, as the art of gathering the tangled threads of forces, conditions, and affairs which make up the elements of any potential human achievement, and weaving them into a perfect fabric.

Command, in its broadest sense, includes ability to apply knowledge and training to any situation which may arise, in anticipation, during the event, and afterwards. It includes not only tactical and administrative situations, but also logistic, strategic, economic, ethnic, political, and other situations which affect national security and welfare, or which can be made to serve them. Command is too commonly thought of only in terms of high command or the commanding officer of a ship. The necessity for exercising command extends down through all grades, and through all subdivisions of the organization. The line officer needs the principles of command from the day he leaves the Naval Academy. The extent to which he comprehends and applies these principles determines his progress in the art of command.

Specialists

The complexity of modern existence demands specialists and experts who have devoted themselves to attaining perfection in detail in the arts or sciences, in order that full advantage may be taken of their possibilities. Nevertheless, the more deeply one is absorbed in the minute details of a particular activity, the less he is able to comprehend its relation to other activities, or to understand the proper coördination of all. The art of command is in itself a task of the first magnitude, requiring a very particular kind of training, and constant vigilance, lest undue devotion to detail in a technical subject distort vision and impair proper sense of values.

A specialist is one trained to know. To exercise command it is essential to have officers who have been trained to think. Technical specialization tends to undermine resourcefulness. Resourcefulness is a trait of character absolutely essential in a commander who has to face many unknown conditions. Technical specialization makes more difficult the exercise of command, through making more difficult the universally recognized necessity—indoctrination. In order that this may be clear, the War College definition of doctrine should be noted. It is: The authoritative mutual understanding which serves to coördinate the actions of the units of any organization.

General Knowledge

Colonel Thorpe quotes Ward to the effect that:

> . . . . when the great truths are known, every minor truth, every small item of knowledge, every detail in the whole range of experience and nature, finds its place immediately the moment it is presented to consciousness. And only to a mind in possession of general truths do such details possess any meaning of any value.

Thorpe says further, "The guiding prin-

ciple should be that the most general knowledge is the most practical."*

War

War is no longer merely a fierce contest between small bodies of professional adversaries. It involves whole peoples and whole continents. It calls upon every known art and science and upon every possibility of invention and discovery to serve its ends. A broad knowledge of world affairs, a comprehensive knowledge of the principles of nature and science, and of the application of those principles to the affairs of man, are essential to the modern commander.

The importance of material preparation for war has been so stressed that the necessity for it is widely recognized. So complex and impressive are the engines of war, and so all-embracing are the supplies required, that it sometimes seems as though wars are won in the shops and industries, prior to hostilities. While there is no doubt of the importance of these things, no degree of material preparedness will avail against an astute adversary unless it is employed to advantage. Thus, ability to use material to the best advantage, and a thorough knowledge of how and when to use it most effectively, are essentials of the art of command.

Ability to exercise command requires as much preparation as does the supply of material. This preparation must take place in peace. It consists not only in acquiring knowledge and vision, but also in developing ability through the actual exercise of command in peace.

The costly method of preparing to exercise command after hostilities commence is told strikingly by Admiral Scheer in his narrative of the German High Sea Fleet. From the first efforts, where a few unaided craft failed to accomplish their mission in full, to the final stages, where every operation was undertaken with the full strength of a coördinated fleet supporting the smallest unit, there can be traced a slowly dawning realization of the meaning of the art of command.

The Line Career

An officer necessarily controls his own development to a large extent. He must plan his own career, select his own reading and perform his own study. His work in any grade should be in the nature of a post-graduate course leading to a degree (commission), as in college. No small part of the value of an examination lies in the study and work required in preparation for it. If this work is guided it has boundless opportunities for developing a proper understanding of the principles of command. Unless the line officer is pointed constantly toward the goal—proficiency in the art of command—he may be diverted and he may waste his effort on incidental details.

The titles of line rank are indicative of the line mission. They do not imply technical specialization in any subject, but they indicate responsibility for exercising command. If such titles are misapplied to the distinct professions included in the staff corps of the Navy, or to the line officers who have restricted their mental development to the narrow confines of a technical branch, proper emphasis on the essential mission of the line is reduced.

Not all of those who are trained in the art of command will master it. In order to insure an adequate choice for high command, the bulk of the line should be trained for it. Although a limited number of officers from the line may specialize, it must be recognized that such officers are definitely diverted from the preparation required to fit them to command. Officers can be fitted for command at sea only through systematic training during long, variegated experience in the Navy. On the other hand, expert technicists, capable of the highest order of purely technical work, are available in civil life, and, with little naval experience, can render highly specialized service under direction of naval officers competent in the art of command.

Material-Mindedness

Devotion to technical detail, with neglect of the broad preparation necessary to exercise command, has come to be known as "material-mindedness." In civil life, the material-minded worship material things and comforts, to the exclusion of spiritual and cultural values. In military life, the material-minded devote themselves to machines, to the neglect of the art of command.

The effect of material-mindedness on the fighting ability of the British fleets was

* Pure Logistics, by Col. G. C. Thorpe, U.S.M.C., p. 116.

understood and was inveighed against prior to the World War. Critics of the Admiralty policy of allowing the wholly materialistic "two-power standard" to govern training and operation were justified by the events of the war. Admiral Scheer accuses the British of allowing material considerations to govern all operations of their overwhelmingly superior fleet.

That we have not escaped a tendency toward material-mindedness is evidenced by the number of agencies that we have established for the express purpose of combating such a tendency. As will be seen, they have not been wholly effective in eliminating the tendency, but they have retarded the drift toward materialism.

Office of Fleet Training

One of the most important agencies established to counteract the tendency toward materialism is the Office of Fleet Training. This office grew out of the target practice office, and is but an extension of that office. Before the target practice office was established, the material bureau which supplied the ordnance material to the fleet also guided its use. In the fleet, "ordnance" (i.e., guns, shells, powder, etc.) was understood, but "gunnery" (i.e., the use of ordnance—the greatest possible number of hits on the enemy in the shortest possible time) was virtually unknown. Gunfire was not correlated with other activities, and no pressure was exerted to force improvement in gunnery. Standards were not established, methods were not compared, and results were uniformly poor.

The Department took the lead in correcting this condition. It pointed out the difference between ordnance and gunnery. It renamed ordnance officers afloat "gunnery officers," and gave them duties commensurate with their new titles. It compared and analyzed performances, forced comparison of methods, promulgated standards and standard practices, and published competitive results.

The effect was immediate and lasting. Gunnery developed apace. Gunnery and tactics were coördinated. The technicists on shore were kept busy supplying new devices to meet the ever increasing demands of command for yet more effective gunnery. The expansion of the target practice office into the Office of Fleet Training extended the Department's leadership to activities other than gunnery, but it does not yet embrace all of them.

The War College

The War College is, of course, a pioneer agency in the field of stressing the importance of the art of command. General Order 168, concerning it and its related activities, shows that we are alive to its value.

The award of certificates of proficiency in strategy and tactics is a big advance toward combating ignorance of the art of command. The system might be improved by requiring the commanding officer's endorsement as to the ability of the officer concerned to apply what he has learned.

Engineering Only

Recent legislation concerning line officers who are restricted to the performance of engineering duty only is a recognition of the need for a few technicists of rank and experience within the Navy. At the same time it is a recognition of the stultifying effect of purely technical training and experience on preparation to exercise command.

Present Tendencies

Notwithstanding the excellence of the steps which have been taken to combat material-mindedness, the tendency persists. Material is a tangible object which we have before us constantly. It presents endless problems which press for solution. Since the principles of command are not concrete objects, and since deficiencies in ability to command are seldom conspicuous short of the acid test of war, we naturally tend to devote more attention to material than to those principles.

Our tendency toward material-mindedness is indicated by the history of some of our official publications. For example, in January, 1923, although there were excellent publications on the material phases of communications, there was no regular, authoritative publication devoted to operational and personnel phases. Accordingly the Communication Division Bulletin was started. It bore on its cover a statement to the effect that it was not intended to incorporate matter contained in technical bureau publications. This policy gradually lapsed, and by September, 1924, the statement disappeared.

That this was significant of a state of mind is indicated by the fact that by the fifty-first issue, in March, 1927, 26 per cent of the space in this publication was devoted to considerations purely material.

There is a drift on board ship toward the mental isolation of officers into groups roughly parallel to material cognizance. This intensifies the effects of specialization. For example, Bulletins of Engineering Information may be received on board. Although they may contain important strategical or tactical information, seldom are they circulated beyond those officers who happen to be performing engineering duty at the time. Rarely is anyone else interested in the possible contents of such bulletins.

A reason given for the failure to disseminate information among all officers is that they have not time to read all the matter which comes to a ship or office. When the mass of detailed literature issued by the officers of the Navy, with little or no coordination, is considered, this reason seems plausible. Nevertheless there is much important professional information which could be indicated by someone, and which should be properly disseminated to all line officers. So strong is the tendency toward specialization, that it is difficult to awaken enthusiasm among officers to acquire general knowledge from the wealth of sources available, and the occasional, lone seeker is regarded as a nuisance.

Postgraduate System

The report of a subcommittee of the board of visitors at the Naval Academy a few years ago pointed out the influence of the postgraduate specialists. The postgraduate system has overstressed the material side of the Navy's training and instruction in the art of command. As originally conceived, the postgraduate system was to afford special training to a limited number of carefully selected officers, who might thereby become especially qualified for design, inspection, and other necessary material work, when they were on shore duty. Large numbers of officers (as many as can be spared from other duty) are now given the postgraduate course, which has become increasingly technical. They are employed as long thereafter as possible in their specialty, both ashore and afloat.

The presence of a large number of budding specialists in proximity to the Naval Academy cannot fail to exercise an influence on the impressionable minds of the midshipmen. It cannot fail to distort in their mind the true image of the mission of the line. Aside from this, the postgraduate system has tended to create and maintain a corps of specialists. The effect of this on the service is reflected in the demand for postgraduate technicists in positions which they are by no means necessarily qualified to fill. For example, there is a demand for them in administrative capacities on shore, and on operating staffs afloat. The resultant trend toward materialism, as an end rather than as a means to an end, is illustrated in the regulations of the fleets and forces. The relative space devoted to material details, such as repairs, upkeep, alterations, reports, returns, etc., indicates the trend.

It is not suggested that the postgraduate system be abolished. On the contrary the ever increasing complexity of the fighting machine demands additional technical training and ability. It is imperative, however, to consider the effect of the present methods, and to revise them so that a proper balance is maintained. Everything must have its proper weight, according to the relation it bears to the whole.

Operation (Material)

A widespread ignorance of the principles of command is exhibited in the common attitude toward the organization of the Office of Naval Operations, particularly as to the material division thereof. If officers in the material bureaus had a proper grasp of the principles of command they would understand the need for the existence of this division, that its mission does not in any way overlap the functions of the technical bureaus, and that no technical bureau could perform the work it is assigned to accomplish. Similarly, if all officers on duty in the material division of operations had a thorough knowledge of the art of command, there would never be just cause for complaint that the material division was usurping any of the functions of a technical bureau. Furthermore, if the service at large had a complete understanding of the principles of command, it could not continue to regard with indifference the occasional

outpourings of ignorance on this particular phase of command.

EXAMINATIONS

Every officer appears before the naval examining board or one of its branches, more or less periodically, for what amounts to requalification. The law requires the examining board, in effect, to satisfy itself as to the mental, moral, professional, and physical fitness of an officer to perform all his duties at sea before he can be promoted to a higher grade. Since ability to exercise command in some degree is a part of the duty of every line officer, it is apparent that it is the duty of the board to satisfy itself as to his ability in that respect.

It is fully as important to discover an officer's appreciation of the relation of his knowledge to the art of command as it is to ascertain his knowledge of a subject. The present written examinations are devoted to determining specific knowledge of various subjects, and they fail to emphasize sufficiently the ultimate goal of all line training and study—proficiency in the art of command—especially in the lower grades. General Order 168 emphasizes the necessity for preparation for high command, but in General Orders 49 and 126, which outline the scope of examinations for promotion, there is no marked emphasis on the principles of command.

To illustrate what are believed to be shortcomings in the present written examinations with reference to the broad education required for a proper understanding of the art of command, it is convenient to set forth some questions. Each of the following questions may be considered to have a reasonable bearing on a suitable understanding of the principles of command. How many questions of similar import have been asked in actual examinations for promotion?

The U. S. naval policy of December 1, 1922?

The National Defense Act of 1920?

The navigator's work (or what may be expected of him in relation to the captain in applying the principles of tactics in battle)?

The strategical aspects of the engineer officer's work?

The training (education) of personnel?

The status of affairs and our policy in Nicaragua?

The status of affairs, our policy, and what is really at stake in Mexico?

The situation and our policy in China?

Our aims, and the occurrences at the Geneva Conference?

The details, policy, and the results of the discussions over the limitation treaty (gun elevation, other modernization)?

The effect of the limitation treaty on our strategy and tactics?

The status of our merchant marine, its suitability, and availability as a fleet reserve and auxiliary?

The principles involved in the Dardanelles campaign?

The principles involved in the unified command of the Allied forces in the World War?

The principles involved in joint Army and Navy action, now in process of elaboration and perfection by the Joint Board?

The principles involved in the present organization and distribution of the fleet?

The accomplishments, objects, etc., of the Sixth Congress of American States at Havana?

Certain acts of American naval officers in our early relations with Samoa were condemned and disavowed by our government. What has been asked concerning why and how they erred?

Tactical blunders were made by naval forces on shore at the occupation of Vera Cruz. How many questions have been asked to bring out the principles involved?

Seven destroyers were wrecked in a great catastrophe. The Department laid down definite rules regarding the relation of doctrine to command responsibility. How many questions have been asked on these principles?

At the wreck of the destroyers there was misunderstanding and doubt about the use and limitation of radio direction finders. Later a plane was lost at sea for days, due to failure of air and surface personnel to coördinate their efforts and to make full use of all information available to them by radio direction finder. The principles involved in both these cases have been carefully elaborated. How many questions have been asked about them on examination?

For nine years an admiral on the active list occupied one of the highest diplomatic posts in the service of our government. He has recently been relieved amid universal acclaim for his accomplishments under trying and peculiar circumstances. How many questions have been asked to ascertain service knowledge of where he was, under what circumstances, and what he accomplished?

The Bureau of Navigation, at considerable expense and effort, places good professional libraries on ships. What incentive is there to use them? What is done to

ascertain if they are used? How many questions have been asked to see if any of them are read, except those on material?

Remedies

Since materialistic tendencies persist, in spite of the agencies established to offset them, some additional action is needed. Reform is best initiated through existing organization. Therefore, it is profitable to determine what measures can be applied to the end desired, by existing agencies.

As actual knowledge is now determined by written examination, that medium could be used to determine an officer's appreciation of the relation of his knowledge to the art of command. If officers are to be ready for the special training prescribed for them in General Order 168, emphasis must be placed on command through all grades. The examinations for promotion from the grade of ensign and all later ones should be framed to determine the officer's understanding of the art of command.

While it is believed to be not insuperably difficult to overcome the deficiencies of the present written examinations, there must be first a clear understanding of the objective, i.e., the "whys." Every question should lead to a clear understanding of its answer's relation to the efficiency of a command in preparation for war.

The Navy has long recognized that operations, personnel, and material are major subdivisions in the art of command. If, on a par with these, we add a subdivision embracing inspection, statistics, and research, which, for brevity, we may call "intelligence," we insure thoroughness, and we emphasize the separate factors entering into the principles of command. Inspection includes critical examination, official test, and supervision; statistics deal with the classification and arrangement of facts; research is careful inquiry or investigation. The subdivision intelligence, embracing all these items, is essential to the art of command because it concerns the result of information, knowledge, and experience—the evaluation of facts.

If we group our examination questions under the recognized subdivisions, and if we make them pertinent to these headings, we force attention to the factors necessary to proper appreciation of the art of command. To this end, *all* questions for *all* grades in *all* subjects should pertain to and should appear under the four major headings: intelligence, operations, personnel, and material.

Naturally, a material bureau which finds an officer adept at supervising some material activity, desires to keep him at that work as long as possible, to the advantage of its industrial output and its financial showing. If he serves too long in that capacity, the officer ceases to advance in general knowledge and experience, and his progress in the art of command decreases as his material absorption increases. As this can occur only when the Bureau of Navigation permits it, obviously that bureau, through power of detail to duty, can prevent specialization due to employment.

Aside from the incentive to education afforded by examinations for promotion, and beyond its responsibility to afford wide experience by varied detail to duty, the Bureau of Navigation is charged with education. Although excellent courses of instruction in a wide variety of subjects are now available for enlisted men, very little systematic instruction is provided for officers afloat.

The award of certificates of proficiency in strategy and tactics is made on successful completion of a course of instruction offered by the War College. The Bureau of Navigation might well offer courses in other subjects, especially other subjects pertaining directly to the art of command. If such courses were suitably administered under the commanding officer, there seems to be no reason why arrangements could not be made to consider the successful completion of a course and the endorsement of the commanding officer testifying to practical ability, as a part of the examination for promotion.

Although it has always been felt that the law on promotion contemplated something written, it does not prescribe the character of the examination, and it does not require that a written examination be undergone immediately prior to promotion. A properly administered system of the type suggested would not only tend to spread out an officer's development over his time in a grade, avoiding final "cramming," but would also reduce the time, effort and expense of long, written professional examinations.

A part of the Navy's tendency toward

specialization arises from an unsound attempt to copy industrial life. This attempt ignores the facts that industry has a large reservoir of executives to draw upon, that the art of command demands much beyond mere executive ability, and that the regular line personnel of the Navy is the only source, and a limited one, for the supply of competent naval commanders.

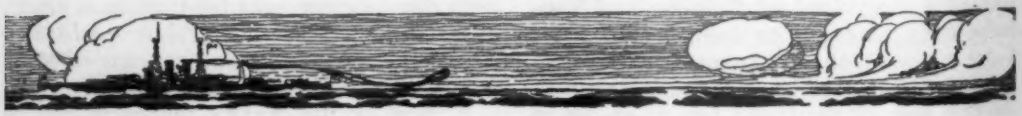
In the very nature of things, material considerations receive vast publicity from the highly specialized bureaus charged with cognizance over the various kinds of material. This is right and proper, but it is imperative that other agencies, charged with developing other factors of the art of command, give corresponding publicity to those factors and to the art of command as a whole. The Office of Naval Operations (especially through the Office of Fleet Training), the Bureau of Navigation, and other agencies of the Department, should take the lead in leaving no opportunity unused to impress upon all line officers the one mission—proficiency in the art of command. Their efforts should be seconded by fleet and unit commanders afloat, who should spare no effort to secure adequately balanced treatment of all phases of the art of command, in all publications and discussions, and to force balanced development of officers. Even the commanding officer of a single ship should actively aid this development, by insisting upon adequate dissemination of information and its proper consideration by officers under his command.

Another remedial step which can be taken readily is the reorganization and redistribution of staffs afloat. Unit and fleet commanders should have on their personal staffs, which should be operating staffs, as distinct from technical or administrative staffs, officers skilled in dealing with the various phases of the art of command. Such a staff, properly organized, could handle administrative details satisfactorily in its spare time. The post of the technicists is on board the repair ships and tenders, with their machines, where they can make full use of their individual talents, and be readily available to render skilled assistance to ships.

Discipline is a powerful influence in regulating affairs. The just application of disciplinary measures to officers because of neglect or improper performance of material duties is recognized as a proper procedure. It is accepted that accounting, upkeep, care and repair of material must be accomplished according to fixed and well understood standards or that penalty must be incurred. But we have not yet reached a sufficient appreciation of the principles of command to contemplate with equanimity the definite fixing of responsibility and the application of penalties for all failures of command, whether they involve material or not. There can be inexcusable ignorance of, neglect of, or indifference to, the duties of command, which may, without hazarding or impairing material, cause ineffective gunnery, ineffectual maneuvering, poor engineering, economic waste, costly delay, etc. To develop properly the service appreciation of the responsibilities of command, we shall have to be as strict and impartial about these failures as we are about material ones.

CONCLUSION

Enough has been said to show that we are not fostering sufficiently the development of knowledge and proficiency in the art of command in all officers in all grades. The steps taken, although partially effective, have not stemmed the tide of material-mindedness with which we are in danger of being engulfed. Other steps can be and should be taken. Increased emphasis must be laid on the importance of training and education in the art of command. Thought in terms of command must be stimulated. Unless definite further action is taken, our present tendencies, following the age in which we live, will lead us more and more toward materialism and specialization, and we shall become less and less proficient in the art of command.



The U.S.S. *Niagara*

By Rear Admiral Elliot Snow (CC)
U. S. Navy (Retired)

Come, read ye all this little scrip
It is no silly fable
'Tis all about a mighty ship
Which laid the Atlantic Cable.[1]

IN NOVEMBER, 1856, when the U. S. steam frigate *Merrimack* first visited English waters, loud were the praises bestowed upon her—the first of six steam vessels authorized April 6, 1854. The largest one of this program—the *Niagara*—generally spoken of as a frigate, being associated with the building of the *Merrimack*,[2] came in for her share of commendation from the English press, which said:

The *Niagara*, one of the largest of these steam frigates, is much more formidable than the *Merrimack*, and would make John Bull open his eyes, for he has not in all his vast and splendid Navy, recently supplied with ships intended to be the most terrible in power of their armament, to cope with Russia in the meditated attack upon Cronstadt, a ship that could withstand the shock of battle with the *Merrimack* to say nothing of the five remaining steam frigates.

The wooden steam Navy of the United States, in these six vessels, reached its highest development. "Our naval architects who had produced" these were among the most eminent of American shipbuilders. John Lenthall, the chief constructor of the Navy, the two Delanos, Messrs. Pook and Hanscom, Mr. George Steers and several others, all famous in their line, had a hand in placing our vessels in the fore rank of the world as regards design, construction and equipment.

The U. S. sloop of war *Niagara* has justly been characterized as a "peace-maker of the world," not simply on account of her strength as a naval unit and consequent ability to uphold and strengthen the hand of diplomacy for peace, but because she, in company with H.M.S. *Agamemnon*, helped to lay, on the ocean's bed, a slender thread of which John G. Saxe wrote:

Loud ring the bells, for flashing through
Six hundred leagues of water,
Did Mother England's benison
Salute her eldest Daughter.

The part the Atlantic cable played in maintaining peace between England and America during those dreadful years of 1861-5 can scarcely be overestimated.

The way the *Niagara* appeared as she was launched was described thus:

THE NIAGARA[3]

As She Appeared Before She Was Launched
Drawn by Parsons

The largest ship house in the Brooklyn Navy Yard was found to be too small to entirely cover the hull of the *Niagara*, so the builder was obliged to extend it out of the front of the house some thirty or forty feet.

The workmen engaged on the towering bows of the *Niagara*, while thus suspended mid air, seemed but little pigmies clinging to her gigantic sides, while the complication of scaffolding, the dark and intricate lanes of massive timber, the mysterious gleams of light, the long prospective views on the deck of the *Niagara*, were all calculated to inspire feelings of profound awe and of admiration at the genius of man; and regret, that so much outlay of wealth and of thought, was for the destructive engines of war rather than for the furtherance of the blessings of peace. In front are to be seen various munitions of war with which the Brooklyn Navy Yard is liberally supplied. On the morning of the launch, thousands crowded in front of the *Niagara* and watched with

[1] With apologies to the memory of John G. Saxe, whose words are here paraphrased, and in no sense detracting from the great coöperative work of Her Brittanic Majesty's naval service, in the laying of the cable.

[2] "She was, in fact, an exceedingly large sloop of war and not a frigate at all." See the *Steam Navy of the United States*, Frank M. Bennett, U.S.N., 1896.

[3] "Launching of the Steam Frigate *Niagara*." *Frank Leslies' Illustrated Newspaper*. March 8, 1856.

intense interest the first movement of the projecting bows; presently, the vivid flash of light came from the *North Carolina;* then, as the loud thundering report echoed over the Bay and Island of New York, the dark mass, as if inspired by the warlike sound, started from its resting place and mysteriously sank back into the bosom of the bay. The loud cheers of brave men presaged tears of patriotic emotion, and sincere prayers for the future glory and success of the noble vessel so gracefully ushered into active life.

The launching of the U.S.S. *Niagara* from a slip at the Brooklyn Navy Yard on February 23, 1856, was characteristically, a great success—"not an incident occurred to mar the festivity of the occasion or retard the business of the day"—and the operation was attended with the usual recovery of floating lumber as the following account shows.

The time finally selected [for the launching] was happy in the extreme, the day being warm and balmy, without even a ruffling breeze, and the river in the vicinity of the Navy Yard was quite free from ice. Notice of the event was only given the same morning of the launch, yet a vast assemblage of persons from all parts of the city thronged the Navy Yard, and crowded the wharves on both sides of the East River, at every point from which the launch could be observed.

Ample accommodations were afforded to spectators. In the yard platforms were erected for the ladies and children, and the United States ships *North Carolina, Sabine,* and other vessels were thrown open to the public. In addition, one of the Green Point ferry-boats, provided by Mrs. Steers, took a large company of ladies and gentlemen, who had been invited, to a good point in the East River for witnessing the interesting event.

A very strong cradle was constructed under her, and powerful chains and beams passed through the hold to prevent her from straining in leaving the ways, while her stem was buoyed up by a number of empty casks for the same purpose. Everything being ready and the critical moment being announced by salvos of artillery, the blocks were knocked away at eleven o'clock, and the vessel slowly glided down the ways and into the water. So easy, quiet and graceful was her motion that persons close by her would not have known that she was launching if they had not been watching her. She left the ways and as she kissed the wave a young lady (Miss Anne O'Donnell, of New York), performed the ceremony of christening her; the guns of the *North Carolina* belched a national salute, and cheer upon cheer rang out from the thousands of spectators which lined the shores of the East River. The impetus was so slight that she ran but two or three lengths into the river and then stopped. [As she came to rest] George Steers, who stood at the end of the dock, fairly leaped from the ground in his exultation.

It may not be uninteresting to the reader of today to state here the relative size of the then four largest ships of the world.

The *Persia,* just taken her place in the Cunard line, is 390 feet long and 3,600 tons burden. The *Niagara* is 4,200 tons burden and 345 feet long. The *Adriatic,* just ready to be launched for the Collins' line of steamers, is 352 feet long but her measurement of 5,500 tons makes the *Niagara* and *Persia* small by comparison. The mammoth steamship now building on the Thames, England, is almost twice as long as any of the vessels named above, being 634 feet, while she measures 27,000 tons. Seven times as much as the *Persia.* The measurement of the relative length of the six new war steamers ordered by government, measured from fore side of rabbit of stem to aft side of forward stern post, on a line of twenty-one feet above the lower edge of the rabbit of the keel, is as follows:

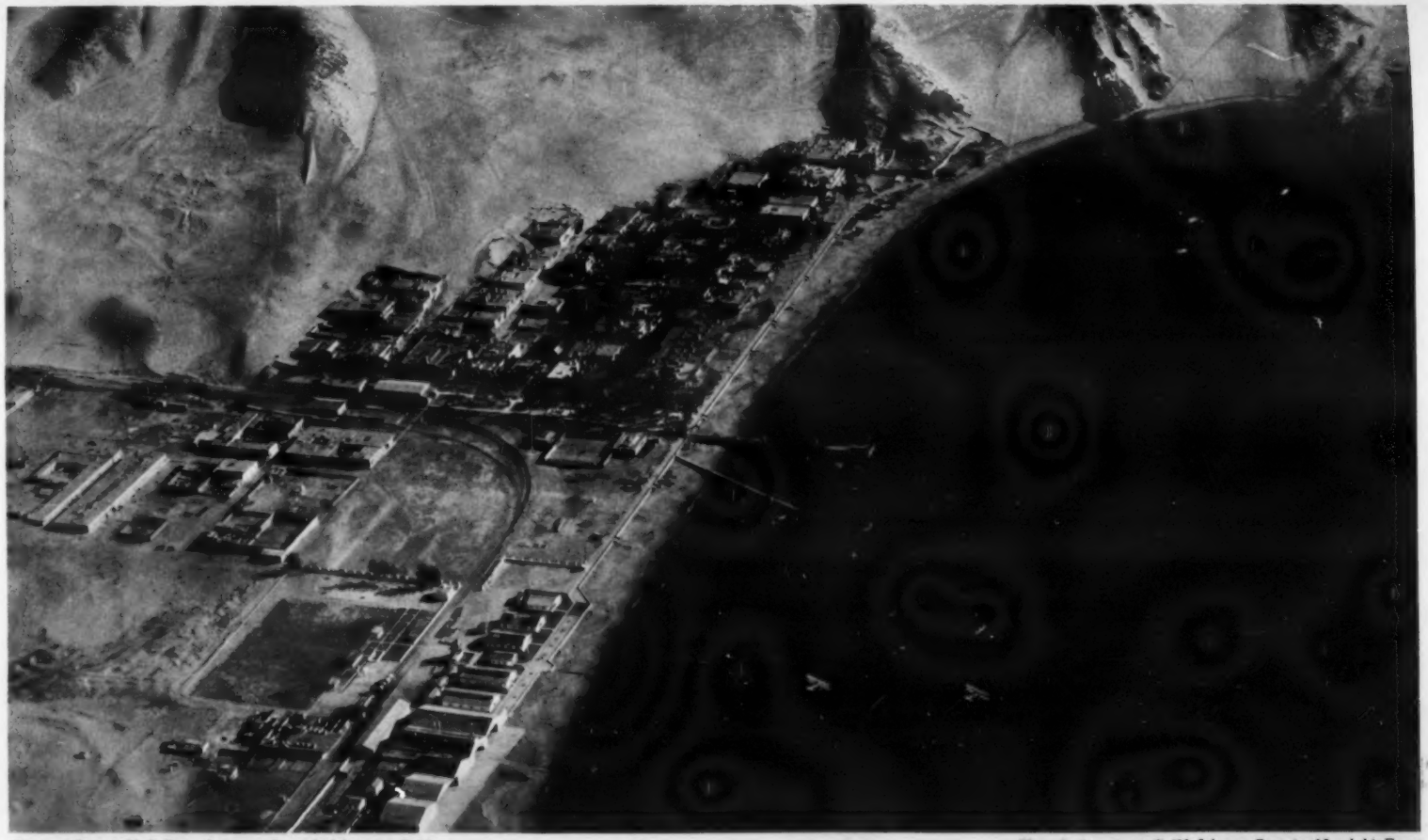
Minnesota	264 feet	8½	inches
Wabash	262 feet	4	inches
Merrimack	255 feet	9	inches
Roanoke	263 feet	8¼	inches
Colorado	263 feet	8¼	inches
Niagara	315 feet		

The *Niagara* is also not only the largest of the six screw frigates ordered by the government, but is the largest ship now afloat in the world. The actual dimensions of this magnificent vessel are as follows: extreme length of deck, three hundred and forty-five feet; depth of hold, thirty-one feet; extreme breadth fifty-five feet; capacity five thousand two hundred tons. Her armament will consist of twelve gigantic pivot guns, weighing twenty-seven thousand pounds each, requiring a charge of fifteen pounds of powder, and carrying shot weighing one hundred and seventy pounds.

When full rigged, the mainmast will be one hundred and eleven feet high, the mainyard will be fifty-five in length, the mizen spanker boom sixty-seven feet. The frame of the *Niagara* is constructed wholly of white oak; for the gratification of the curious readers we give the amount of material used, exclusive of machinery and armament.

Live oak timber	40,000 cubic feet
White oak timber	10,000 cubic feet
White plank, superficial	11,000 cubic feet
Yellow pine timber	42,000 cubic feet
Yellow pine plank	60,000 cubic feet
White pine timber	8,000 cubic feet
White pine plank	42,000 cubic feet
Iron bolts in the hull	400,000 pounds
Galvanized iron and spikes	25,000 pounds
Copper bolts	130,000 pounds
Composition bolts	16,000 pounds
Diagonal iron braces	169,000 pounds
Weight of hull	2,750 tons

Recently many majestic looking "keepers of the World's Peace" have "been at home" to the public in the Hudson River. Our capital ships of today lead the world in design, construction, equipment and maintenance, as did the grand steam frigate *Niagara* of 1856.



Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

NAVAL AVIATION SCHOOL AT ANCON AND TOWN OF ANCON, PERU

The establishment of the air line to Iquitos (cutting a thirty-day journey to two days) was the work of naval aviators under the U.S. Naval Mission to Peru. The following pictures will illustrate the voyage across the mountains to Iquitos.

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

HARBOR OF CALLAO, PRINCIPAL SEAPORT OF PERU, FROM THE AIR

HARBOR OF CALLAO, PRINCIPAL SEAPORT OF PERU, FROM THE AIR

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

AIR VIEW OF LIMA, CAPITAL CITY OF PERU

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

BETWEEN LIMA AND THE "TOP"

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

GETTING NEAR THE TOP
(Too near for most of us!)

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

JUST AFTER LEAVING SAN RAMON FOR MASISEA.—CHAUCHAMAYO RIVER

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

THE TOP

Just before crossing the range that separates San Ramon and the Chauchamayo Valley from the Amazon River Basin.

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

DOWN AMONG THE NATIVES

Sometimes storms force planes to land on the sand beaches of the islands in the river to wait until the storm has passed.

Sometimes storms force planes to land on the sand beaches of the islands in the river to wait until the storm has passed.

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

OVER IN THE RIVER REGION

This is Puerto Victoria at the junction of the Palazu and Pichio Rivers—forming the Pachitea River. A little further down the river joins the Alto Ucayali to form the Bajo Ucayali. At this point is Masisea, where one changes from landplanes to seaplanes to continue on to Iquitos, 400 miles further down the river.

Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

TYPICAL RIVER REGION

Note plane on beach in lower left corner, forced down to wait passing of tempest. Fortunately, low water. During five months of the year these islands and beaches disappear with high water.

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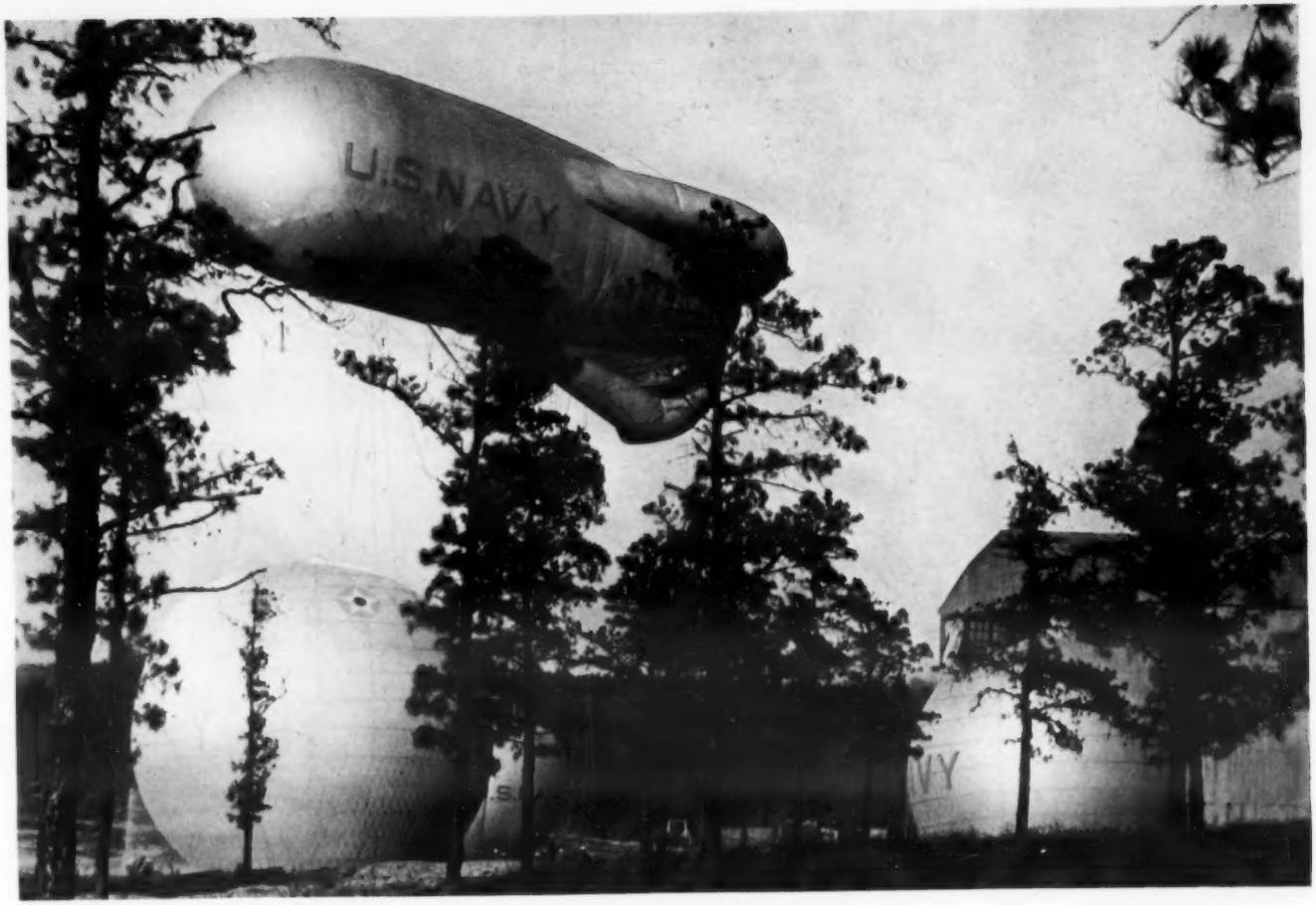
Courtesy Captain H. B. Grow, Inspector General of Aviation, P. N.

Photo by Lieutenant G. W. Johnson, Peruvian Naval Air Force

THE END OF THE LANDPLANE JOURNEY

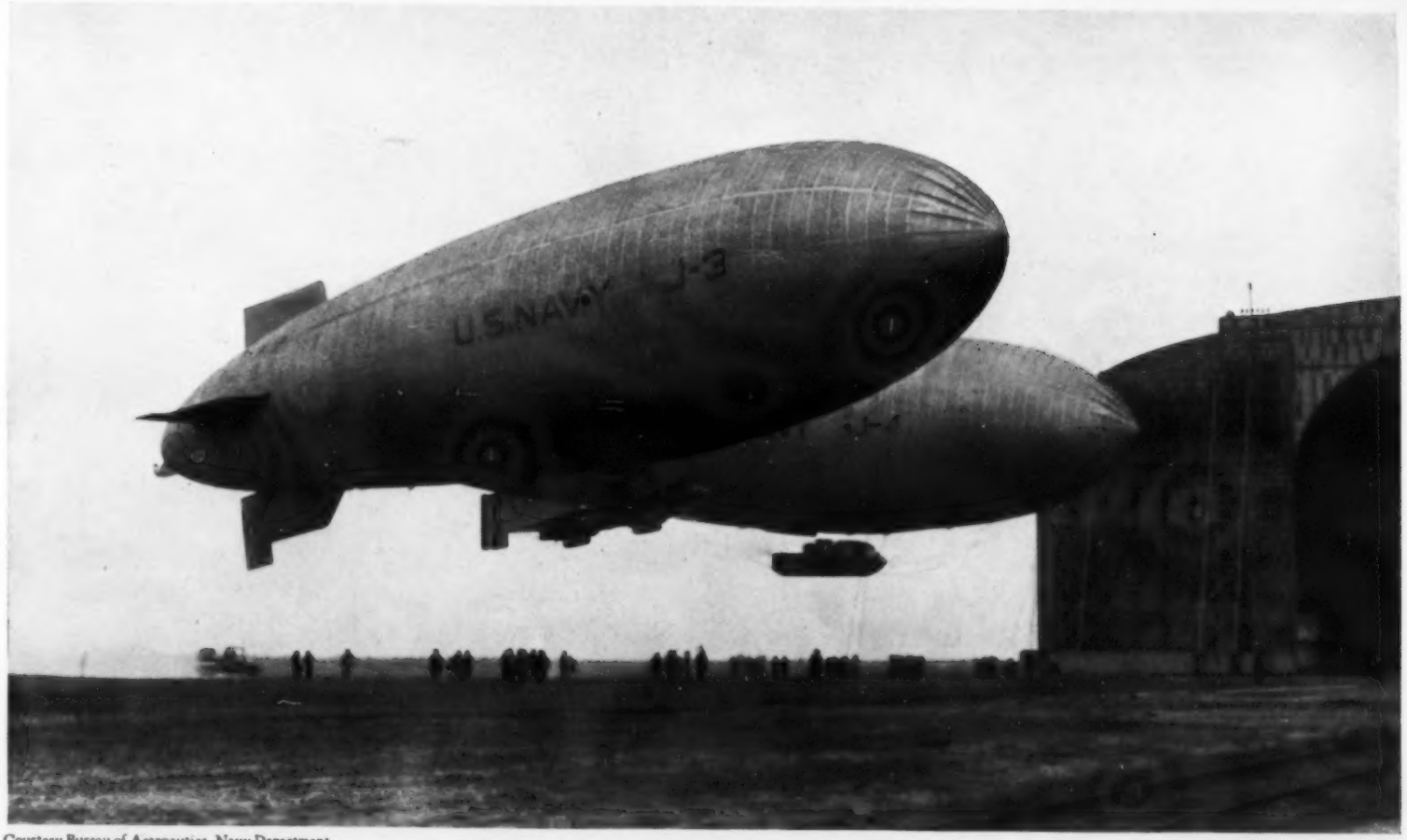
Masisea air base on the Ucayali, two and one half hours from San Ramon (formerly fourteen days by mule and canoe). The field is back of hangar. Note seaplane in water waiting arrival of landplane. Here mail and passengers are exchanged, each plane then returns to its base. Iquitos is five hours down river (five days in steamer)



Courtesy Bureau of Aeronautics, Navy Department

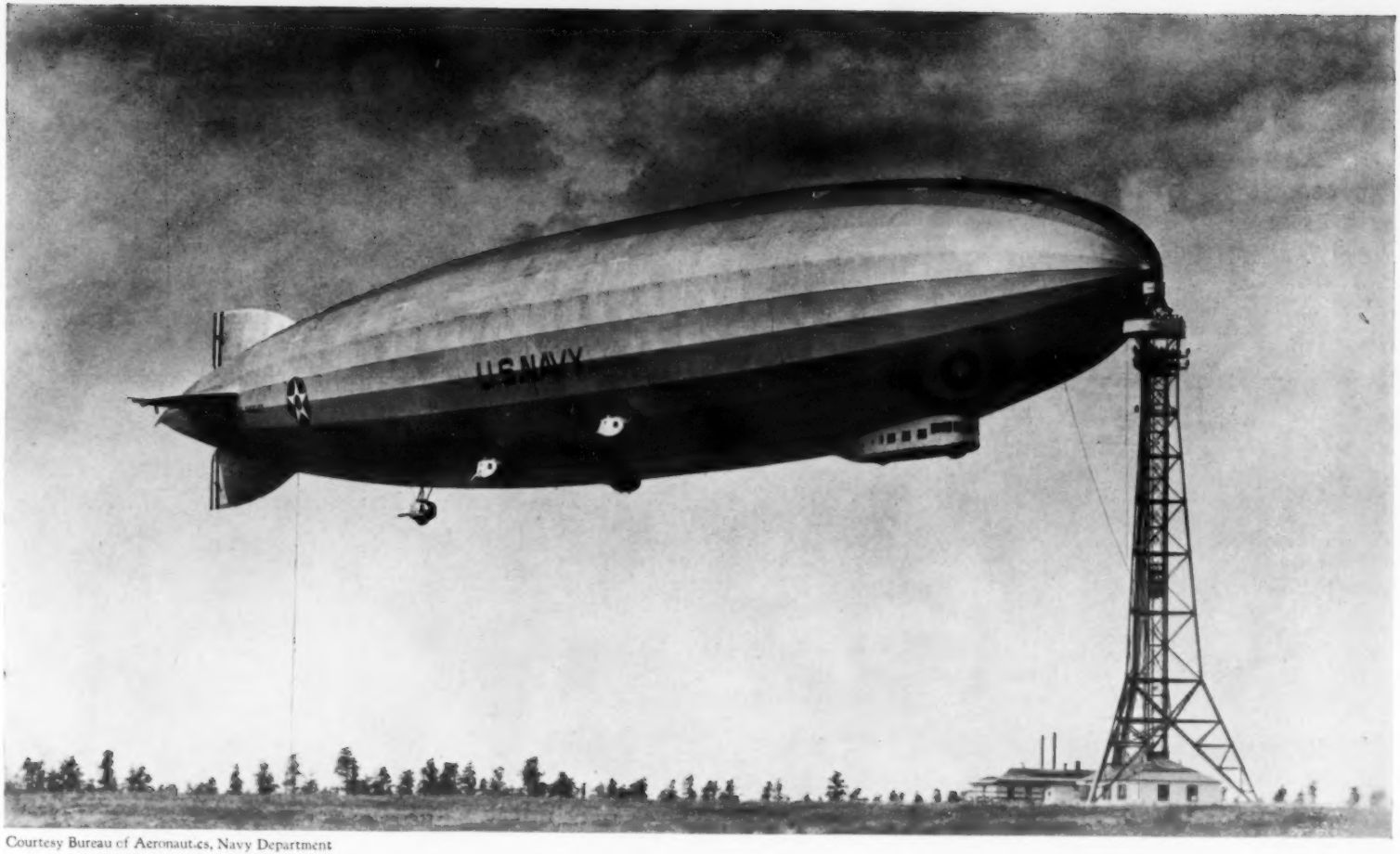
BALLOON OPERATIONS AT LAKEHURST, N. J.
Kite balloon ascending, free balloons nearing completion of inflation.

Kite balloon ascending, free balloons nearing completion of inflation.



Courtesy Bureau of Aeronautics, Navy Department

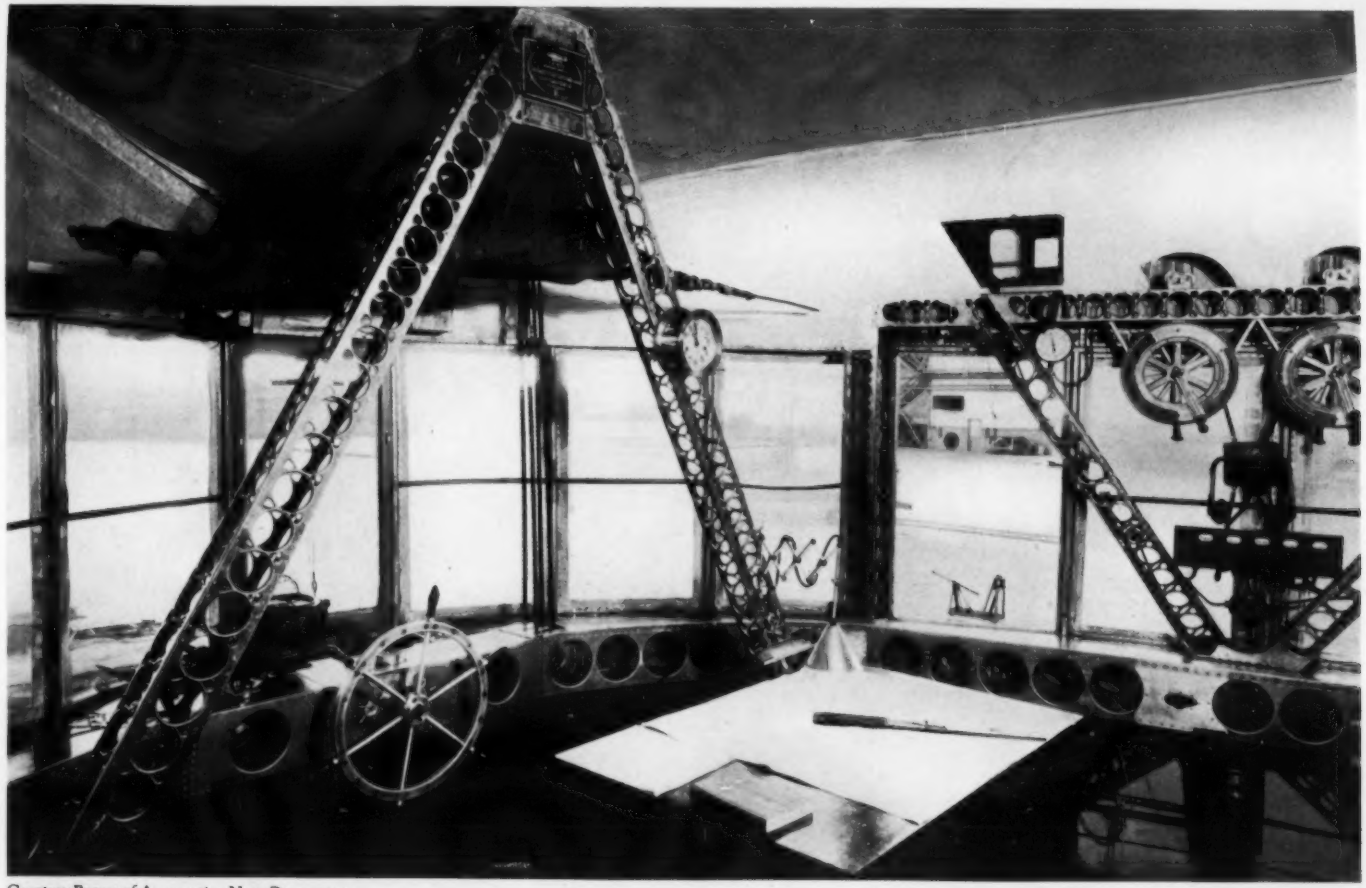
U.S. NAVY NONRIGIDS *J-3* AND *J-4* TAKING OFF AT LAKEHURST, N. J.



Courtesy Bureau of Aeronautics, Navy Department

U.S.S. *LOS ANGELES* MOORED TO THE HIGH MOORING MAST, NAVAL AIR STATION, LAKEHURST, N. J.

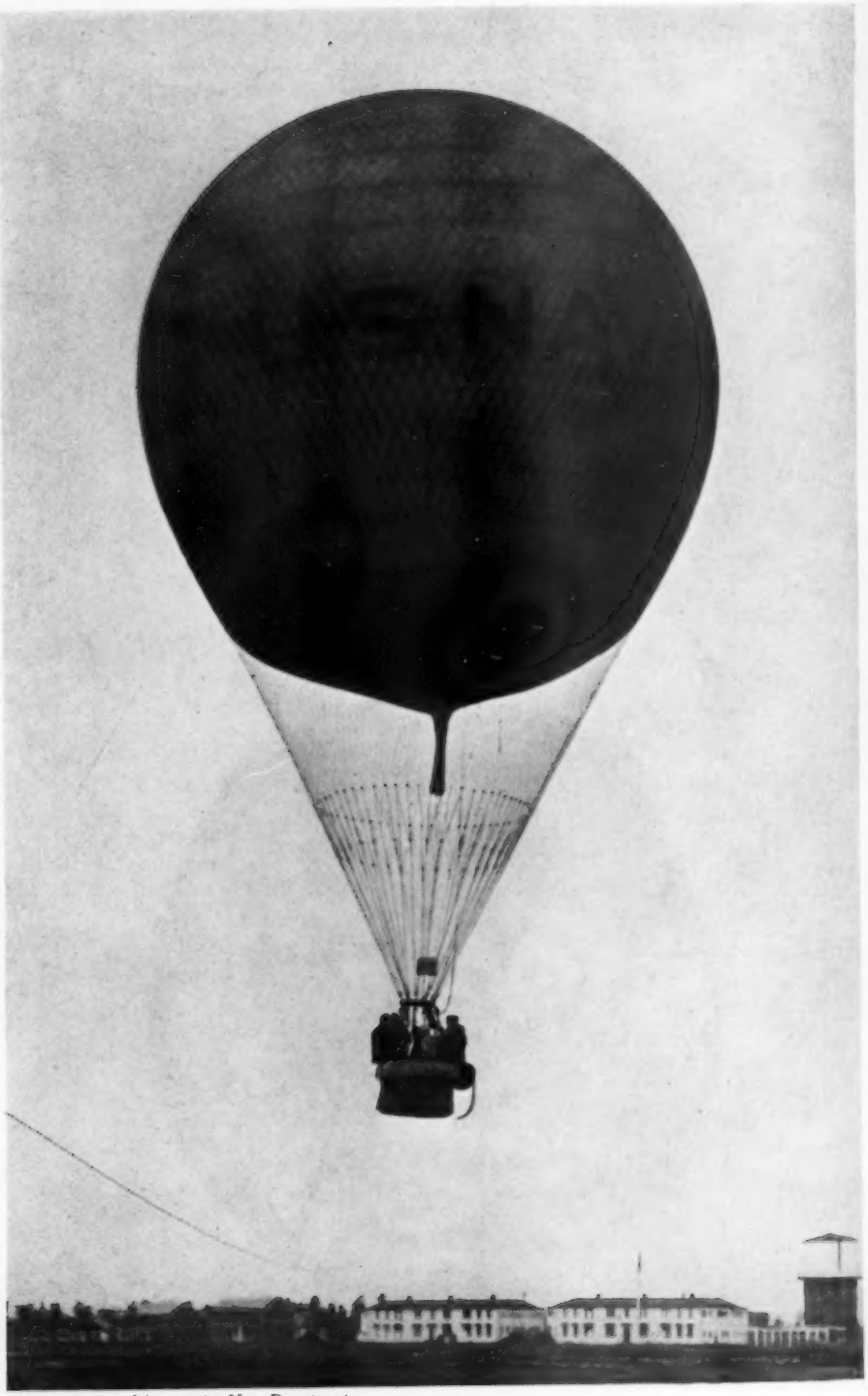
U.S.S. *LOS ANGELES* MOORED TO THE HIGH MOORING MAST, NAVAL AIR STATION, LAKEHURST, N. J.



Courtesy Bureau of Aeronautics, Navy Department

VIEW OF STARBOARD SIDE FORWARD IN *LOS ANGELES* CONTROL CAR

Note rudderman's wheel, compass, chart table and locker, engine telegraphs, telephones, drift meter, etc.



Courtesy Bureau of Aeronautics, Navy Department

U.S. NAVAL FREE BALLOON LEAVING LAKEHURST

Airship Personnel

By LIEUTENANT COMMANDER CHARLES E. ROSENDAHL, *U. S. Navy*

WRITERS both in and out of the service frequently contribute articles on the subject of aëronautical training, the illustrations of which almost invariably show the candidate strapped in an ingenious whirling chair and being gyrated about to test his sense of equilibrium and, incidentally, his digestive organs. If not otherwise informed, one might easily suspect that successful flying from the pilot's standpoint is mainly a matter of being able to extricate himself and his craft safely and sanely from an intricate maze of acrobatics. Most such articles also ignore the fact that aëronautical endeavor comprises two main divisions: "aviation," which is the art of operating heavier-than-air craft; and "aërostation," the art of operating lighter-than-air craft. Generally we also find the term "airship" applied to airplanes and all types of aircraft whereas strictly and properly that term is applicable only to the dirigible balloon. However, this is comparable to the commonly accepted and broad use of the term "aviation" to denote all forms of flying, and, after all, usage is the determining factor. Lighter-than-air and heavier-than-air activities, never properly competitors, do have complementary functions as evidenced, for instance, by the incorporation of facilities for five service airplanes in each of our new naval airships.

Knowledge of such matters in the service is becoming more sought after because of the pending expansion of lighter-than-air activities in our Navy by the acquisition in the near future of two large scouting rigid airships, the *ZRS-4*, and the *ZRS-5*. The most engrossing feature at the present moment is that of obtaining trained personnel to man these craft, and the incidental billets involved in administration, bases, etc. Since the general service is the source from which such personnel must come, it is my purpose to furnish information on that subject of possible interest to the service.

As is probably known, many years ago it was evident that the two branches of aëronautics were divergent enough to warrant specialization and, accordingly, two courses of training were laid down. Heavier-than-air training is conducted principally at the Naval Air Station, Pensacola, Florida, whereas the Naval Air Station, Lakehurst, New Jersey, has the training of lighter-than-air personnel. Certain extracts from the law are given here to point out the legal requirements as to qualified personnel.

> That . . . . the term "naval aviator" . . . . shall mean any commissioned officer or warrant line officer in the Navy or Marine Corps who has successfully completed the course prescribed by competent authority for naval aviators and who has been or may hereafter be designated or appointed a naval aviator by competent authority and who has flown alone in heavier-than-air craft not less than 75 hours and who has flown in heavier-than-air craft a total of not less than 200 hours or who has been in the air under training, in rigid airships not less than 150 hours and successfully completed the course prescribed by competent authority.
>
> That hereafter when a line officer of the Navy is to be detailed to the command of a Navy aviation school or of any Navy air station or of a Navy air unit organized for flight tactical purposes he shall be a naval aviator. Line officers detailed to command of aircraft carriers or aircraft tenders shall be naval aviators or naval aviation observers who are otherwise qualified.

From these it will be seen that officers duly qualified in either heavier-than-air craft or lighter-than-air craft are "naval aviators." For departmental differentiation, however, "naval aviator (airship)" is the term applied to qualified lighter-than-air officers and simply "naval aviator" to those in heavier-than-air. The same insignia is worn by each, and the Navy Register notes no distinction.

Enlisted personnel who duly qualify as pilots of heavier-than-air craft are designated "aviation pilots"; a similar designation for enlisted men as pilots of lighter-than-air craft once existed but is no longer in force. It is possible that some day it

may become wise to resurrect this old lighter-than-air designation for enlisted pilots of certain types of airships. There does exist the designation of "balloon pilot" for enlisted men whereby those fully qualified as pilots of free and kite balloons are rewarded with a one-wing emblem. The status of flying enlisted men other than pilots will be dealt with later.

The essential and fundamental differences between heavier-than-air craft and lighter-than-air craft themselves are of course the factors that dictate the differences in the training of their personnel. The airplane is yet essentially a high-speed, relatively small-load-carrying instrument of transportation of comparatively short range; the airship is fundamentally a steadier speedy carrier of great loads over wider ranges such as ocean expanses; i.e., the airship is logically the aërial parallel of the seagoing steamer. Nevertheless, there is a certain sense of "flying feel" and a distinct coördination necessary in lighter-than-air flying as well as in heavier-than-air; without it no man becomes a really useful or successful pilot or member of an airship crew. It is an erroneous impression that personnel who cannot achieve a heavier-than-air designation or who can no longer fulfill such requirements can fall back into an easier situation and achieve a lighter-than-air designation. It is for this and other reasons a wise policy which prohibits "bilgers" from one branch going to the other.

In selection for lighter-than-air training, the same general physical standards obtain as for heavier-than-air. It is highly desirable that an officer or enlisted man have shown definitely an inherent or developed sense of responsibility before coming into airships, as no extra personnel can be carried in flight to "pinch hit" in billets where someone else falls down on the job. As most enlisted men in the aëronautic organization rightly are rated men, the standards for petty officers should and must be strictly adhered to. This makes it a difficult problem to obtain proper material for training, since no general service ratings may now be converted into aviation rates, and our recruits are but youngsters, bright enough it is true, but not necessarily yet possessed of a sense of responsibility. As a rule, officers and men who have had seagoing training before coming to lighter-than-air, show unmistakably the value of such training in their resourcefulness, sense of responsibility, and various other characteristics. Furthermore, since naval aircraft are only naval auxiliaries, the personnel manning them are better members of the Navy for having made contact with and understanding other portions of the parent organization.

Airships are first of all ships; they happen to be ships of the air. The common-sense principles of seamanship applied and modified where necessary to the requirements and environments of airships, become "airmanship." Aërostation requires a thorough understanding of certain simple laws of physics and demands constant attention thereto, but in many ways follows the operation of surface craft. The analogy between the submarine submerged and the airship is quite extensive in both operational and constructional features; consequently initial seagoing training is an advantage. A glance at the control car or "bridge" of a rigid airship, plus the typewriter in the radio room, and the Navy standard "distribution of copies," are evidence of ship practice. Furthermore, the organization is "Navy standard" to the fullest possible extent. There may somewhere be a need for what is called "avigation," but airships find the fundamentals of "navigation," brought up to date by modern short cuts and adapted to another dimension by suitable instruments and equipment, still applicable. Incidentally, flying demands have given general navigation quite a stimulus and such features as the shorter solutions, camera sextant, etc., although developed primarily for aërial use, will undoubtedly soon be used extensively in surface navigation.

Physical requirements for lighter-than-air are sometimes erroneously believed to be less stringent than those for heavier-than-air. This is indeed a mistaken idea; as a matter of fact, in extended flying for several days at a time or longer the physical strains and endurance demands are almost always greater in airships than in airplanes, where flights are generally of shorter duration. A stout heart, stable nervous system, and capable physique are just as essential in one as in the other. Excellent vision and its allied features of depth and color perception, etc., are equally important in each. The necessity for excellent hearing in fly-

ing has perhaps been a little overemphasized; airships will always carry rated radio operators, but everyone in an airship crew must be able to hear sufficiently well to catch spoken orders under conditions existing in flight. In the matter of equilibrium, perhaps, it is not so important that the candidates for lighter-than-air achieve such a high qualitative standard as that for heavier-than-air but he must indicate the correct reactions to a reasonable degree. While hot and abundant food is available in airships, nevertheless the candidate must possess unimpaired digestive organs which will function in spite of possible lack of normal exercise for several days at a time.

When detailed to airship training, an officer is designated a "student naval aviator (airship)."

The training of naval aviators (airship) is according to a prescribed syllabus approved by the chiefs of the Bureaus of Aëronautics and Navigation. The general course consists of the Ground School Course, the Flight Training, and certain other forms of experience in practical subjects.

When a class reports for training, its members immediately appear before a medical examining board to determine their fitness for aviation duty, as prescribed in the Manual of the Medical Department, United States Navy; this examination is in addition to any previous examination they may have undergone. If found physically qualified, each student is given one flight under good conditions in a free balloon for the purpose of assisting him in the general nomenclature of lighter-than-air craft. Students are then assigned in rotation to various units, such as the free-balloon, kite-balloon, and nonrigid-airship departments. The first four weeks are devoted to ground school, except one flight day weekly. Beginning with the fifth week, half the time is spent at ground school and the other half in primary flying instructions.

The subjects covered by the Ground School include: aviation history, aërostatics, aërodynamics, aërology, airship gases, gunnery and bombing, heavier-than-air indoctrination, maintenance, construction and design, aviation engineering plants, airmanship, parachutes, aërial navigation, radio practice, aircraft communications, airship instruments, fleet indoctrination, operation of free and kite balloons and airships, and photography. Instruction in the above subjects is generally by the lecture method, the total number of hours devoted to each subject ranging from three to twenty-five. A written examination is given in each subject in which five or more hours' instruction is given. Flight training embraces free balloons, kite balloons, nonrigid airships, semi-rigid airships (if available), rigid airships, and advanced course in special billets on board rigid airships.

The earliest flight training is in balloons, and the student must qualify as a free- and kite-balloon pilot before proceeding to airship training. Ballooning has long been recognized as a splendid sport but the value of balloon training for airship personnel cannot be overestimated. There is nothing so effective in teaching atmospheric structure as being afloat in a balloon as a free particle in the air. Such experience would be of benefit even in heavier-than-air training. Ballooning is of course of incalcuable value in airships, in case of failure of power plants, or in such instances as the breaking up of the *Shenandoah*, where those who could stay with either part of the ship were saved by their knowledge of, and intimacy with, free ballooning. When air speeds are low as in taking off or landing, the airship operator always has brought home to him in all its undisguised nakedness the fact that his ship is a balloon floating statically in the atmospheric ocean. Seven free-balloon flights are required as a minimum; one of the balloon flights must be made at night, and one must be a solo flight without passengers. Students are assigned practical work in the inflation, deflation, assembly and rigging of free balloons and are required to take charge of the inflation and rigging of the balloons used by them on their solo flights.

A minimum of ten flights and ten hours in the air are required in kite balloons. Students are given practical work in inflation, deflation, ground and winch handling, bedding down in woods, securing in shed, and assembly and rigging of kite balloons, and must demonstrate their ability to handle kite balloons under various conditions. The potential value of kite balloons under some conditions for observation work, plus their value in meteorological study, make this a necessary and desirable feature of the training.

Nonrigid airships possess naval uses and value which make their operation and development very desirable. At present, however, our efforts are concentrated on rigid airships and nonrigids are now employed only on training missions. Here too the student learns respect for many of the phenomena of nature and atmospheric structure. Since it is impracticable to let each student solo our only rigid airship as a demonstration of his ship-handling ability, the nonrigid supplies a most important need in this respect and teaches independence and self-reliance in the air. The student is required to assist in the assembly and inflation of at least one nonrigid airship and must demonstrate his ability to take charge of the handling party of a nonrigid airship on the ground under various conditions. A minimum of twenty flights and twenty hours in the air is required of each student; during these flights the student must for specified times act as radio operator and as mechanician. One or more night flights must be made by each student. After ten hours' instruction, the student is checked as to his ability to steer courses, keep constant pressure, and fly at a constant altitude. The student must then make ten satisfactory landings under varying weather conditions, and before qualifying in nonrigid airships, the student must make two flights during specified times of day without an instructor or qualified airship pilot on board.

Semirigid airships bridge the step in size and performance between the nonrigid and rigid types. At present we see no distinct naval need for the semirigid, and consequently, our Navy possesses none. The student, however, receives theoretical instruction in this type.

Training in rigids is the aim of the course, and all other parts of the course are important to the extent that they affect the student's ability in, and grasp of, rigids. Before qualification a student must have a minimum of 15 flights and 200 hours in the air in rigid airships. In addition, the student must have performed certain duties a minimum number of times or for a specified number of hours and have shown by demonstration that he can satisfactorily perform such duties. Also, he must have had at least six months' association with a rigid airship in active operating commission. The prescribed duties in rigid training include:

Ground handling.—Weighing off; gassing ship; docking and undocking; in charge of ground party; receiving and letting go at mooring mast; preparation for flight; fueling.

During flight.—Elevators; rudders; handling ship while moored; officer of the deck or junior officer of the watch in flight; keel officer; engine tender; power watch; navigation.

Upon appearing before the qualification board after fulfilling the above, a final examination, written and oral, on the above subjects and practical work is given.

A certain amount of experience must be gained by the student in practical exercises in the following, in each of which a prescribed minimum must be met: mooring and handling; gunnery; bombing; aërial navigation.

When the student has fulfilled the above and has been recommended by the qualification board, he is designated a "naval aviator (airship)" by the Bureau of Navigation. He has become a qualified pilot of free and kite balloons and nonrigid airships; he has acquired enough fundamental knowledge and practice so that with more application he can become a worthy member of an airship complement. Naval aviators (airship) who have completed the prescribed syllabus for such designation, who have held their designation as naval aviator for a period of at least six months, who have had at least six months' active duty with rigid airships subsequent to holding designation, and who apply to their commanding officer, may be ordered by him to appear before a board of officers, one the commanding officer of a rigid airship, to determine their fitness for the qualification, "qualified to command rigid airships." The officer-candidate must demonstrate to the satisfaction of the board that he is capable of handling rigid airships by actually handling one in various maneuvers.

As indicated earlier, the organization of an airship's company follows as closely as possible surface-craft practice. The officer complement should consist of at least the commanding officer, executive officer, engineer officer, first lieutenant, four watch officers, assistant engineer officer (warrant officer), assistant to first lieutenant (warrant officer).

The commanding officer, of course, takes no regular watch nor does he take other

head-of-department duties as has been done in submarine practice. Either the executive officer or the engineer officer, preferably the former, is also the navigator. In flight, the executive and the engineer stand watch and watch as head of department and acting pilot when the commanding officer is not actually on the bridge, and perform the navigational work. Keeping the course and accurate position is a continuous process in flight and a most important duty.

Two watch officers are taken on short flights; on longer ones, three. One watch officer remains on the ground to handle office work, repair work carried on by men of the crew left on the ground, and to look out for ship's property. One watch officer acts as communication officer, another as commissary, etc. The officer of the deck makes entries in the log and runs interior routine.

The first lieutenant and his assistant stand watch and watch in the keel and throughout the ship on a continuous round of inspection. He is responsible to the commanding officer for the trimming and loading of the ship. When two assistant engineer officers are carried, they have watch and watch in in engineering department of the ship; otherwise the one assistant is available as needed.

The allowance of enlisted flying ratings of the *Los Angeles* is as follows, and other staff ratings bring the total to fifty:

3 chief boatswain's mates
3 boatswain's mates first class
4 boatswain's mates second class
6 coxswains
1 quartermaster first class
1 ship's cook first class
1 chief radioman
1 radioman first class
5 aviation chief machinist's mates
5 aviation machinist's mates first class
6 aviation machinist's mates second class
6 aviation machinist's mates third class
1 aviation chief metalsmith
1 aviation metalsmith first class
1 aërographer

This flying personnel is divided into three sections, one section remaining on the ground each flight, so as to alternate the flight duty. In flight, there are thus provided two men for each station, standing four hours on and four hours off, except on the controls, where two hours on and four hours off is the rule.

At the mooring mast and at all times outside the hangar there is always on board one full flying section, i.e., one man for each station. A head of department, a watch officer, an assistant engineer, and a keel officer are always on board during such times. When in the hangar, the officers stand a "day's duty" and the crew's watches are arranged so that they stand one day's duty (twenty-four hours) in six, there being an engineer and a member of the deck force on watch at all hours in the ship.

In order to increase the morale of rigid-airship crews and to provide recognition for the effort expended in becoming proficient in this special duty, paralleling existing practice in submarines, there will shortly be put into effect the designation for enlisted men of rigid-airship crews of "Qualified for rigid-airship duty." This designation will carry with it the right to wear an approved embroidered distinguishing mark in the form of a rigid airship. A man is not eligible for designation by his commanding officer as "Qualified for rigid-airship duty" until he has had the following minima of flying hours:

(a) In rigid airships, 150 hours;
(b) In nonrigid airships, 4 hours;
(c) In kite balloons, 5 hours;
(d) In free balloons, 3 flights of at least 1 hour each.

Before being designated as qualified, every man must appear before a board and pass satisfactorily an oral and practical examination which will demonstrate his knowledge and ability in all general matters pertaining to the operation of the rigid airship on which he is serving. This examination consists of two parts, viz.: (a) knowledge of the subjects that are required of airship men in general, regardless of rating; and (b) knowledge of the subjects that are required of airship men in the specialty of their ratings.

The general subjects referred to in (a) above include: (a) elementary knowledge of aërostatics, aërodynamics, aërology, lifting gases, airship engines, and airship fuels; (b) ground handling of lighter-than-air craft; (c) emergencies; (d) ballast and fuel systems; (e) electrical system; (f) gassing and gas-cell arrangements; (g) nomenclature of lighter-than-air craft; (h) mooring; (i) outer cover; (j) inflation, rigging, berthing of free and kite balloons; (k) care

and preservation of hulls and structure of lighter-than-air craft; (l) major and minor control systems; (m) use of parachutes; (n) hangar routine; (o) ordnance.

The special subjects referred to include, ratings of the seaman branch: (a) ability to stand either rudder or elevator watch in a rigid airship; (b) ability to stand a rigger's keel watch in a rigid-airship. For ratings of the aviation branch (machinist's mates and metalsmiths): (a) ability to stand a rigid-airship engine-car watch; (b) ability to stand an engineer's keel watch in a rigid airship. For any other ratings: (a) thorough knowledge of the care, operation and preservation of all machinery, appliances and equipment to which the man may be assigned by virtue of the rating held.

There is a definite division of duties in an airship so that separate deck and engineer forces as well as certain specialties are necessary. Not so long ago the rating of aviation rigger was abolished. The value of the abolition of this rating is at least questionable insofar as concerns lighter-than-air craft.

The deck force of the *Los Angeles* is composed of coxswains and boatswain's mates. Naturally it is difficult for them to qualify in salt-water subjects as laid down for boatswain's mates, but nevertheless this is required, in addition to the requirements of the old rating of aviation rigger. Only the most careful scrutiny of personnel exchanges and transfers, plus the continued hearty coöperation of the bureaus concerned, can prevent the gradual dispersion of these trained airship deck-force ratings to general service. An equitable and satisfactory system now exists for the exchange of lighter-than-air enlisted personnel between the *Los Angeles*, the *Patoka* and the Naval Air Station, Lakehurst, to secure for them the required sea- and shore-duty periods. With the expansion of lighter-than-air it may become necessary to restore the rating of aviation rigger or to provide a boatswain's mate (airship) or boatswain's mate (aviation).

By recent despatch the Department has announced the formation of another class of officers for lighter-than-air training to convene at Lakehurst on June 15, 1929. About once a year such a class is formed, its size varying as necessary to conform to other service demands for officers and yet to provide the necessary qualified lighter-than-air officers to keep abreast our program. Largely because of limited material, the course generally lasts from eight months to a year. However, this is not excessive when we consider that the lighter-than-air course is decidedly a more academic one than is heavier-than-air training; also when we think of the high regard for proper and sufficient aëronautical training reflected in the German training of commercial airplane pilots in a course lasting four years! One should not get the idea, however, that airship operation is yet as stabilized as surface operation has become nor that it is purely an academic matter, for it is decidedly not so. Neither is nerve, alone, all sufficient. The successful airship operator is the one who combines a fundamental knowledge of physics with practical consideration and judgment in developing to a full extent the inherent possibilities of the airship, and at the same time husbands his resources.

Airships are not yet perfected machines, but their potentialities are great enough to insure the continuation of the project to a highly successful status. The problems are not insurmountable and solutions to many important ones are in sight. We should not expect miracles in aëronautics any more than in any other form of engineering endeavor. Progress in all forms of transportation was the result of hard work and slow steady effort, so it will continue to be with aircraft. But in the advancement of the material side we must not lose sight of the equally important phase of adequate and trained personnel.

A Plea *for the* Decimal Division *of the* Degree

By L. M. BERKELEY

Author of *North Star Navigation, Great Circle Sailing,* etc.

THE origin of the degree as the unit of angular measurement is lost in the mists of antiquity. Just why the 360th part of the circumference was selected as such unit, is not known. It has been conjectured that this fraction was adopted from the number of days in the year, the number being erroneously estimated at 360 instead of 365, but there seems to be no historical evidence to support this view. Among primitive people, three was taken as the value of π (see II Chron. 4, 2). This made the circumference six times the radius, and seemed to give an intrinsic significance to the number six. Even after this value of π was found to be erroneous, it was perceived that the radius, applied as a chord six times in succession, fills out the circumference exactly; and six retained its importance as a natural unit. Another natural unit was ten (the number of the fingers and toes); and it was doubtless through the combination of six and ten that the sexagesimal system was evolved.

Whatever the origin of the system, it prevailed universally among the Greeks, and by their influence was imposed upon the world so firmly that there were no indications of any change until the time of the French Revolution.

It was proposed at that time to abolish the degree, and to substitute in its place a more natural unit, arrived at by dividing the right angle into one hundred divisions called grades. But this system never came into general use. There were too many books and tables embodying the old unit for the public to accept the change; and furthermore, for the purposes of astronomy and navigation, it is necessary to have some convenient relation between time and arc; and so long as the day is divided into 24 hours, a circumference of 360 degrees is far better than one of 400 grades. There is no present indication that the world will ever abandon the day of 24 hours; and that being so, the circumference of 360 degrees is not likely to be changed.

But when it comes to subdividing the degree, the situation is different. The natural, logical, and scientific method of dividing any unit of measurement is the decimal method. In this day and generation, no argument in favor of the metric system is needed. It is universally used by scientists, and its merits call for no discussion. Why then do mathematicians continue to divide the degree into sixtieths called minutes, and each of these into sixtieths, called seconds, to the unending confusion of minutes and seconds of arc with minutes and seconds of time? Why do they continue to carry out laborious and tedious calculations for the purpose of finding fractional parts of a degree in these arbitrary sub-units? Which is easier to deal with, 36.491 degrees, or 36 degrees, 29 minutes, and 27.6 seconds?

This sexagesimal division of the degree is not even consistent; for when it comes to fractions of a second, these are not expressed in "thirds," but in decimals of a "second."

There is no more burdensome task than to interpolate in a table (e.g., an azimuth table) where the entries are given in degrees, minutes, and seconds. Where the entries are in degrees and decimals of a degree, the work of interpolation, wearisome at best, is so much lightened as to become by comparison almost a pleasure. In the latter case, the seeker after accuracy may be encouraged to proceed occasionally to second differences; in the former case, never. To lay down the ordinary book of

logarithms, with its prolix and tedious interpolating devices, and take up a table (such as the five-place table of Bremiker or that of Gravelius) with the degree divided into hundredths, is like emerging from a crooked and muddy country lane upon the Lincoln Highway.

For the purposes of navigation, the division of the degree into hundredths seems peculiarly appropriate. It is far easier than the division into sixtieths, and it is sufficiently accurate to satisfy even those careful souls who work out their results to seconds. One hundredth of a degree is about one half a nautical mile, or about one kilometer. This should satisfy even the most meticulous; but if it does not, then nothing is easier than to add another decimal figure, which will bring the degree of accuracy up to less than a ship's length.

In the PROCEEDINGS for February, 1927, page 189, a well-known writer on navigational subjects confesses his love for decimals of a degree, but intimates a certain hopelessness at the prospect of their adoption. But *nil desperandum est.* There are indications that the sexagesimal division of the degree is going the way of the mastodon and the dodo. Says Professor D. E. Smith (*Hist. Math.*, vol. 2, p. 228): "For circular measure it is losing its hold as decimals become better known, and seems destined soon to disappear."

The civil engineers have dropped the second, and use only degrees, minutes, and decimals of a minute. Aquino's recent book *(Sea and Air Navigation Tables)* does the same. *H.O. 203* gives the azimuth in degrees and decimals of a degree. These are indications of present tendencies.

As already intimated, one difficulty in adopting decimals of a degree is the necessity of maintaining an easy correspondence between time and arc. Not that the present relation is an easy one, since it is quite the contrary. For example, an observer calculates the local hour angle of a star. He wishes to compare it with the Greenwich sidereal time of the same star, in order to get his longitude. His chronometer gives Greenwich mean solar time. He must first convert this into Greenwich sidereal time, and then convert this result into degrees, minutes, and seconds of arc before he can make his comparison. But why not manufacture a chronometer giving Greenwich sidereal time in the first instance, and giving it in degrees and fractions of a degree? For many years, arc has been measured in time units, as witness the tables in Bowditch. Why not reckon time in units of arc? Let the face of a chronometer be divided into 360 degrees. Let the longer hand make one revolution in twenty-four hours of sidereal (or mean solar) time. While it is moving one division, a smaller hand may make one revolution around a circle divided into 100 divisions. Each of these one hundred divisions can be roughly subdivided by estimation into tenths. If the chronometer ticks five (or ten) times while the smaller hand travels one of these one hundred divisions, the estimation becomes still more accurate. In this way, the time of an observation can be read off as so many degrees, and so many hundredths and thousandths of a degree. As each degree corresponds to four minutes of time, we may thus read to a quarter of a second of time, which is ample for all purposes.

In passing, it may be remarked that the time kept by such a chronometer would be extremely useful for the purposes of broadcasting. When time is radioed in hours, minutes, and seconds, all the navigators receiving it (perhaps 500) are obliged to convert it into arc, before they can use it. Why not broadcast it in a shape ready for use, and thus save these 500 calculations?

There is not much prospect that the present generation of seafaring men will adopt any innovation, no matter how meritorious it may be. The ancient adage about teaching old dogs new tricks is peculiarly applicable to old sea dogs. But with the aviators it is different. They are young, forward-looking men, practicing a rapidly progressing art. They have no time for tedious, ancient methods. They are content with nothing less than the best and speediest. In the PROCEEDINGS for July, 1928, page 551, Lieutenant Commander Weems suggests a new form of chronometer, keeping sidereal as well as mean solar time, and he has adopted the idea in his system of air navigation. This is a step in the right direction.

It is always to young men that the world must look for the adoption of new ideas. And so the apostle intimated two thousand years ago: "I have written unto you, young men, because ye are strong."

The Storming *of the* U.S. Consulate *at* Honolulu *in* 1870

By ALBERT PIERCE TAYLOR,
Librarian, Archives of Hawaii

THE spectacle of United States marines storming an American consulate in a foreign country to compel the United States consul to lower the Stars and Stripes to half-mast as a mark of respect to a member of the royal family, has probably occurred only once in the history of the United States, and it happened at Honolulu, Kingdom of Hawaii, on September 21, 1870.

Despite the fact that the Queen Dowager Kalama, relict of King Kamehameha III, was dead and that this was generally known, even to the United States minister, Henry A. Pierce, and to all other members of the diplomatic and consular corps accredited to the Hawaiian capital, the American consul, Thomas Adamson, Jr., refused to lower his flag to half-mast on the ground that he was not officially in possession of such news.

From the U.S.S. *Jamestown,* commanded by Commander W. T. Truxton, a detail comprising a corporal and a guard was sent ashore to compel the flag to be placed at half-mast, and in the event of non-compliance by the civil representative of the Washington government, to place it there.

In Honolulu the incident was regarded as one of the most amazing in diplomatic relations and was given wide publicity, while Captain Truxton immediately gave evidence of his position by giving a statement to William Jarrett, secretary of the Privy Council, who recorded the captain's statement in a six-page file which is now in the 1870 box in a compartment captioned "Miscellaneous Local," of the government records.

The death of Queen Kalama brought forth this incident which was destined to be a nine-days' wonder, but of sufficient importance to mark it as one of the most extraordinary items in the record of the United States marines.

Her Majesty, Queen Kalama, relict of Kamehameha the Good (III), expired at her residence in Honolulu on September 20, 1870, after a long and painful illness, about sixteen years after the death of her husband. Both he and his queen had been friends of the American government, and the latter, through various naval officers, gave strong evidence that it was quite friendly both to the Hawaiian government and to its rulers.

In 1870, Kamehameha V was on the Hawaiian throne. He was the older brother of Kamehameha IV, who had died in 1853, and both were nephews of Kamehameha III. Honorable Henry A. Pierce was the United States minister resident. In the harbor was the *Jamestown,* Commander Truxton. *The Advertiser,* of September 24, 1870, under the heading of "A High Handed Proceeding," gives the details of the amazing conflict of American marines with the American consul, at the American consulate, the marines following instructions from the American warship commander, Captain Truxton. Here is the account:

> On Wednesday the habitues of Queen Street were witnesses to a most remarkable scene, no less than the landing of a file of marines from the U.S.S. *Jamestown,* under Lieutenant Cochrane, who charged upon the United States consulate and carried it by force, after a short but gallant resistance on the part of the consul and vice-consul.
>
> The cause of this civil war (on a small scale) was the refusal by Mr. Adamson, the consul, to lower his flag to half-mast.
>
> It will be remembered that about a month since, it was rumored that the Dowager Queen Kalama was dead, and upon this rumor the flags of the British and French legations were set at half-mast, and were flying that way the best part of the forenoon, when the rumor was found to be

false. The Queen Dowager has lingered along through the month and died on Tuesday forenoon last, when official communication was sent from the Foreign Office to representatives of foreign governments, and when received, their flags were set at half-mast. It was noticed that the flag of the United States consulate was not lowered, and the fact became subject of remark.

Mr. Adamson said that he had not received official notification of the death of the distinguished lady, and bearing in mind the mistake made by the British and French legations, through lack of official information, he patiently waited for official notification from his superior officer, the United States minister resident.

On Wednesday forenoon, an officer of the *Jamestown* waited on Mr. Adamson and stated that the commander of the vessel ordered that the consulate flag should be lowered to half-mast, giving as a reason that the Queen Dowager was dead, and that the flag should be so set as long as the war vessels in the harbor kept their flags in that position.

Mr. Adamson replied that as the superior in rank of Commander Truxton he should not receive orders from him, but would respect and obey the orders of his superior, the minister resident.

At a little after noon a file of marines landed and took charge of the stairway leading to the consulate, while their commander started for the residence of the consul, with whom he soon appeared. Lieutenant Cochrane stated that he had been ordered to land and lower the flag at the consulate. Mr. Adamson replied that he would not permit the act. Lieutenant Cochrane replied that he should be compelled to use force. Mr. Adamson said he should resist, and with the vice-consul, Mr. Christie, went to the door to prevent the ingress of the marines, but after a short scuffle they yielded to superior force, and the flag was lowered.

Soon after the marines had retired the minister resident sent orders deposing Mr. Adamson, and authorizing Mr. Christie, the vice-consul, to take charge of the consulate, both of which were responded to.

The quarrel as it stands between the United States officials is none of ours; but we may be allowed to protest at the course taken by the Commander of the *Jamestown*, in landing a force upon our shores, as an insult to this government. American interests here cannot be benefited by such outrageous occurrences.

Probably as a result of the final paragraph, Commander Truxton filed with the Hawaiian government a statement of his position, which was taken down by William Jarrett. The notes of Mr. Jarrett, as filed in the archives of the Hawaiian government, follow:

Saturday, September 24, 1870

Captain Truxton of the U.S.S. *Jamestown* called and stated that he had called to explain the matter touching the lowering of the United States flag over the United States consulate on the twenty-first instant, said that he had heard that the Queen Dowager Kalama deceased on the twentieth instant, and following the example of the flags of this government, had lowered his ensign to half-mast as did likewise, as he observed, the minister resident of the United States. That he had observed that the consul of the United States did not lower the flag over the consulate, though all the other legations and consulates had lowered their flags.

Captain Truxton then addressed a note to the United States consul, a copy of which he showed, requesting him to lower his flag during that day (that is, the twenty-first) as a mark of respect for the nation over which the husband of the deceased lady had ruled. Captain Truxton likewise showed a note in answer from Mr. Adamson, U. S. consul, of which the purport was that he (Mr. Adamson) denied the authority of Captain Truxton to make any such order and averred that he had not received any official notice of the decease of Queen Kalama from his minister or from any other source, and declined to lower his flag as required by the commander of the *Jamestown;* that under those circumstances, wishing that all honor should be paid to the nation in whose waters he was and feeling aggrieved that the flag over the consulate of the nation which he served as a naval officer should be flying at the mast head, when the flags of all other nations were at the half-mast—he addressed another note to the consul saying that he would lower his flag by the means at his (Captain Truxton's) disposal, and received a reply that the consul (Mr. Adamson) would resist any such effort.

Captain Truxton stated that he did not consider that any matters of official etiquette between the minister and the consul should stand in the way of a proper showing of respect for the nation of whose ruler the deceased lady had been Queen Consort; and that inasmuch as by the rules of his service, as he understood them, the consul was bound to follow the example of the ship which he commanded—and more especially, that of the minister resident of the United States—and further feeling that it was his duty to allow no cause of feeling or want of respect to this nation, he had caused a party of a corporal's guard of marines, without arms other than the bayonets which were at their sides, to proceed to the consulate on the morning of the twenty-first and lower the flag of the United States there, and to keep it so flying until four o'clock in the afternoon.

Captain Truxton further stated that this act was done solely out of respect for this government; that he had no intention of derogating from its sovereignty by the landing of an armed party; that he did not consider his party as armed within the ordinary acceptation of the phrase, or within the purview of the law of nations; and that certainly they were not armed with any means of aggression, but that they were simply landed to compel the obedience of those officers who, as he understood it, were required to follow his example —to an act of courtesy to the nation within whose dominions they were.

Aërial Navigation

By LIEUTENANT COMMANDER P. V. H. WEEMS, *U. S. Navy*

THE science of aërial navigation may conveniently be divided into four parts: (a) *piloting,* in which the position is ascertained from visible objects on the earth; (b) *dead reckoning,* in which the position is deduced at any moment from course and speed of the observer from a known point of departure; (c) *radio position-finding,* in which the position of the observer is obtained by means of radio signals; (d) *celo-navigation,* in which the position of the observer is found by observations of heavenly bodies, the sun, moon, stars, and planets.

To date very little celo-navigation has been done. In fact, some believe the development of radio will make celo-navigation unnecessary. The situation is more like this: piloting and dead reckoning are most used at present, and radio position-finding is fast being developed, while celo-navigation has not been extensively used, and the results obtained heretofore by its use have not been encouraging. The time is fast approaching, however, when the practical application of celo-navigation would be a boon to aviation, particularly to naval aviation. The answer to the navigation problem for long-distance flights seems to be the use of radio position-finding in conjunction with celo-navigation. As Commander Victor Herbster states the case: "For efficient operation with the fleet, an aviator must be able to return to a ship by reliance on methods within his plane." In order to accomplish this mission, he further states that navigation should be used to return to a radius of within twenty-five or fifty miles, which is within range for direction-finding from the plane, then to pick up the ship by means of the radio.

The radio beacon is an entirely different proposition and should prove a great help for the commercial aviator. On the other hand, no matter how valuable to the commercial flier, it would be a mistaken policy for the Navy to put war-time dependency in a method which might be silenced or destroyed for any of various reasons.

Since all of the branches of aërial navigation except celo-navigation are already fairly well developed, this article will be restricted henceforth to the problem of positions by celestial bodies.

If aërial navigation is to come into common use, it must be put on a practical basis, and sea navigation cannot successfully be used in the air unless it is greatly simplified, and some radical changes made. For instance, the ordinary horizon sextant used at sea cannot be used in the air except in restricted cases, for the reason that at night, or over land, or at any but low altitudes over the sea, there is no horizon, and a "bubble" horizon must be substituted. Due to high speeds when in the air, positions at dusk and at dawn, which are standard for sea navigation, are not sufficient, especially when there is a relatively large wind effect.

It would be an excessive and useless load to impose on the navigator to require him to compute the hour angle, and to solve the astronomical triangle by the methods used at sea. Fortunately, we can simplify, to a very great extent, the system used at sea and still be within the limits of accuracy required in the air. In theory we have worked out a very simple method for use in the air, and it now remains to be seen whether or not we present the method to the average aviator in such a practical way that he will put it into common use.

Suppose we ask the question: "How frequently and how accurately must air positions be determined to be of practical value?" As regards speed of solution, will a line of position every ten minutes suffice? If that is too slow, will five minutes do the trick? Somewhere about here we can assume a minimum speed which will suffice

for aërial navigation. Similarly, as regards accuracy, an average error of fifteen, ten or some other amount, could be determined. Then if we can obtain without too great amount of mental wear and tear, results within the limits set, there seems to be no logical reason why the method should not be put into common use. I believe this is the way the matter should be considered, and I further believe we can meet the requirements.

Since August, 1927, with the coöperation of the personnel of the Aircraft Squadrons, Battle Fleet, and of the personnel of the Naval Air Station, San Diego, California, the writer has made numerous tests on the ground and in the air in an attempt to arrive at the most satisfactory system for celo-navigation. The actual results have been most encouraging, particularly for night work.

A fix by the observations of two stars is so much easier to obtain than with the sun alone, that we use one system for day work, and an entirely different system for night work. During the day, the best we know is to solve the astronomical triangle by the easiest available method, for each line of position worked. For night work an entirely new system is used which reduces the actual computations necessary to only one subtraction of time to get a fix. The systems for day work and for night work will now be taken up separately.

Day Work

Equipment: See Fig. 1. The first in importance in equipment is a good bubble sextant, as near fool proof as possible. If the sextant goes "hay-wire" in the air, we have poor facilities for making repairs. Furthermore, the vibration and other adverse conditions in a plane impose greater demands on the sextant. We have obtained the best results using the Bureau of Standards Navy sextant. While we have had considerable trouble with lost motion, with the reading and bubble lights, and with other minor features of the instrument, the important features have stood up well under service conditions. No doubt the minor faulty features can be improved.

Next to the sextant, the watch is the most important item of equipment. Thanks to the fact that inexpensive watches may be had which are guaranteed not to vary in rate more than two seconds per day, we can readily provide ourselves with the correct time to the second. If we stop to consider that a watch registers 86,400 seconds in a day, and that the watch is considered defective if it changes more than two of those seconds, regardless of radical changes of temperature and of position, the engineering feat itself wins our admiration. The question of keeping the correct time is greatly simplified by the fact that we can get a daily (or twice daily) radio tick. It is now possible to keep more accurate time on a good wrist watch than was possible a few years ago after a ship was a few days at sea. Mr. Alonzo Jessop, a member of the J. Jessop & Sons firm of San Diego, California, states that a few years ago twelve or fifteen chronometers were usually on hand for rating, while now this number is reduced to one or two. He attributes this change to the fact that navigators use the radio to rate their own chronometers. He further states that the navigator using the radio tick can give the chronometer a more accurate rating than he can, for the reason that by the time the chronometer is delivered on the dock, the rate has changed due to the handling. Mr. Jessop, who is a yachtsman, tells an interesting experience about a voyage from Honolulu to San Diego during which the small yacht rolled so much that the chronometer stopped, but that a watch kept good time through it all. This discussion is aside from aërial navigation but is included for the purpose of making the point that a chronometer is often no more reliable than a good watch, and further that we may expect almost perfect results with a good watch compensated for temperature, and given only reasonably good care. So far as can be detected, a Nardin meantime watch, and a Patek-Philippe sidereal watch have not changed rates due to being carried in a plane as a wrist watch, and given the care ordinarily given a watch.

With the authority of the commander, Aircraft Squadrons, Battle Fleet, two Navy watches, one of which was regulated to mean time, and one to sideral time, were altered by J. Jessop & Sons so that exact seconds could be set on the watch. This makes it possible to take the watch reading for the exact GCT (or GCT minus twelve hours). For use in aërial navigation, the GAT for the equation of time for

SAMPLE SIGHTS, WORKED BY THE LINE OF POSITION BOOK

USING SECOND SETTING WATCH SET TO GMT. FOR THE EQT OF LOCAL NOON, AND SHOWING SIMPLIFIED FORM FOR NAVIGATION

NOTE: THE WATCH FACE FOR GR.MK IS THE G.H.A. BUT 12 HRS. AND EQT. ARE ADDED TO GET THE GCT FOR PICKING OUT DEC.

IF SIGHTS ARE NOT TAKEN IN CLOSE SUCCESSION, THE SAME WORK AS FOR NO.1 SIGHT WILL BE REQUIRED. IN THIS CASE THE VALUES FOR TERMS L.H.A TO H_c ARE THE SAME FOR EACH SIGHT AND NEED NOT BE REPEATED.

AVERAGE ERROR OF 6 SIGHTS 1.4 MILES

ERROR FOR 6 SIGHTS AVERAGED -4 "

TOTAL TIME FOR 6 SIGHTS 14 MIN.

AVERAGE TIME PER SIGHT 2 MIN 20 SEC.

USED BUREAU OF STANDARDS SEXTANT + U.S.N. HAMILTON CHRONOMETER WATCH AS ALTERED BY J. JESSOP & SONS.

TRUE POSITION OF OBSERVER: L 32°-42' N, L. 117°-11' W

G.H.A. (TIME)	7h-03m-00s	4-26	5-00	5-37	6-15	6-45
G.H.A. (ARC)	105°-45'	106°-06.5'	106°-15'	106°-24.3'	106°-34.3'	106°-41.3'
LONG. (ASSD)	116°-45'	117°-06.5'				
L.H.A.	11°E	11	11	11	11	11
LAT. (ASSD)	33°N					
K	33-29.2 N					
DEC.	16-02.2 S					
K ~ d	49-31.4					
A	563					
B	18760					
LOG H_c	19323					
H_c	39°-51'					
H_o	40°-02'	40°-12'	40°-09'	40°-13'	40°-15'	40°-15'
a	11 T	21 T	18 T	22 T	24 T	24 T
Z	S 23½ E					
ERROR	2A	3.5 T	1A	1T	1T	0
	1	2	3	4	5	6

FIG. 2. LINE OF POSITION WORK BY SHORT METHOD USING G. A. T. SECOND-SETTING WATCH

local mean noon is set on the watch, a direct reading giving the Greenwich hour angle (or its complement). Since sun sights are usually worked after 0800 and before 1600, and further since the equation of time changes not more than 1.3 seconds per hour, by thus using the middle equation of time, a maximum error of only a few seconds can be made, and if this is considered too much, the exact seconds can be set quickly for the equation of time for the instant desired.

By pulling out a ratchet arm, the second dial is moved from one to three seconds in a counterclockwise direction. When released, the ratchet springs back into its housing, and the operation may then be repeated as often as desired. The minute and hour hands are set in the usual way. The ideal condition would be to have a watch which could not only be set to apparent time, but one which could be made to continue keeping apparent time, which would necessitate a varying rate.

The writer has invented an adjustable-rate watch which will keep either apparent or sidereal time in conjunction with mean time, but as the estimated cost of such a watch is $200, and there is at present a small field for its use, it is likely that it will not be manufactured any time soon. The second-setting feature of the altered watches mentioned above is an essential and important feature of the adjustable-rate watch, and is a convenient makeshift. We can thus get nearly all we need by having two second-setting watches, one keeping civil, and one sideral time.

It is surprising that having as accurate time pieces as we do, we have not before this devised some means of reducing the amount of computations in arriving at the proper hour angle. For instance, by using a second-setting watch set to the exact GAT for the middle equation of time, we save this much work:

Watch	4-12-20 (P.M. at Greenwich)
Watch correction ..	(—)28
GCT	16-11-52
Eq. T	(-)12-54
GAT	15-58-58
GHA	3-58-58

The GAT watch gives directly the value of the GHA. Making this computation in the air every time sights are taken, say every half hour, would impose a great deal of unnecessary work on the navigator, and at the same time increase the chances of error. The slight inaccuracy due to the use of the middle equation of time would be more than compensated for by speeding up the work, and by the reduced chances of error.[1]

In addition to the watch and the sextant, the equipment includes a chart mounted on a small board with a light drafting machine, dividers, pencil, work book, and a book giving the tables necessary to work the system used in solving the triangle. Extract from the *Nautical Almanac* is copied in the work book.

The method used in working practically all the sights during this period is that given in the *Line of Position Book*. The compactness and simplicity of the method seems to appeal to aviators, particularly to the reserve officers who are taking up celonavigation for the first time. Having complete altitude-correction tables for all bodies for all types of sextants, and time-to-arc conversion table in a handy place speeds up the solution of sights.

Another saving of time is gained by using the form shown in Fig. 2. Since no repetitions are made and since the work is compact and may be easily checked, both loss of time and inaccuracies are avoided. On my first navigation hop, I worked nine sights in ninety minutes with an average error of 5.6 miles. Except for the last sight where five observations were averaged, all the sights were single observations. The conditions for working were good. When the air is bumpy, the average error may be much larger. One day, after a storm, two officers working sights in the Navy San Diego-San Pedro mail plane got seasick due to the bumpiness of the air and to the strain of taking the sights. The average error for twelve sights on that occasion was about eighteen miles.

Night Work

Equipment: See Fig 3. For night work, as for day work, the sextant is the most important item of equipment. The Bureau of Standards sextant is especially suitable

[1]See Fig. 2 for sample solution.

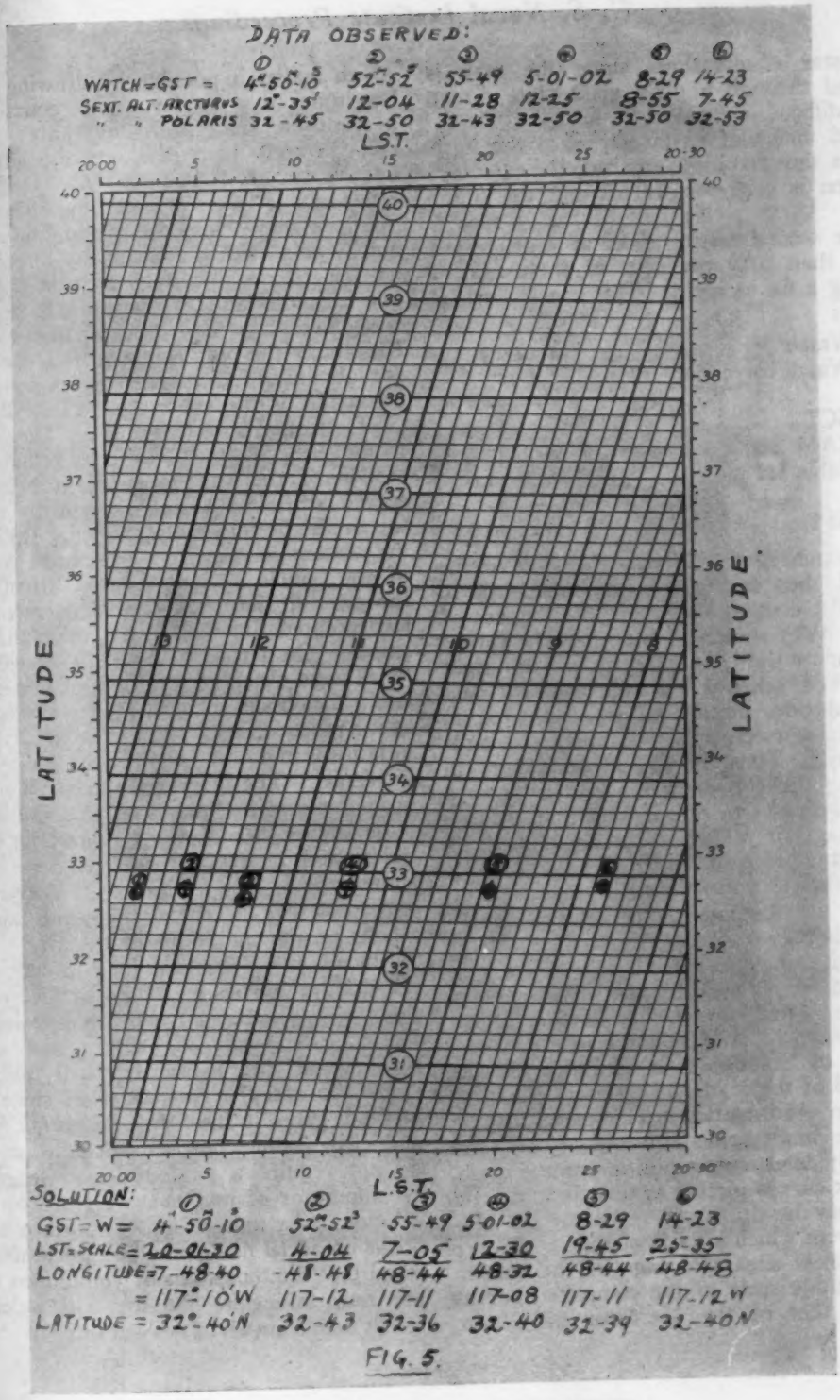


FIG. 4. SAMPLE PAGE OF STAR ALTITUDE CURVES
With six "fixes" worked to illustrate the method.

for star observations since the star is viewed through a plain glass plate direct. The difficult operation of bringing the reflected image of a star down to the horizon is thus avoided; instead, the "bubble" horizon is conveniently brought up to the star.

The second setting sidereal watch saves more than fifty per cent of the work of getting a fix at night. This much work is saved:

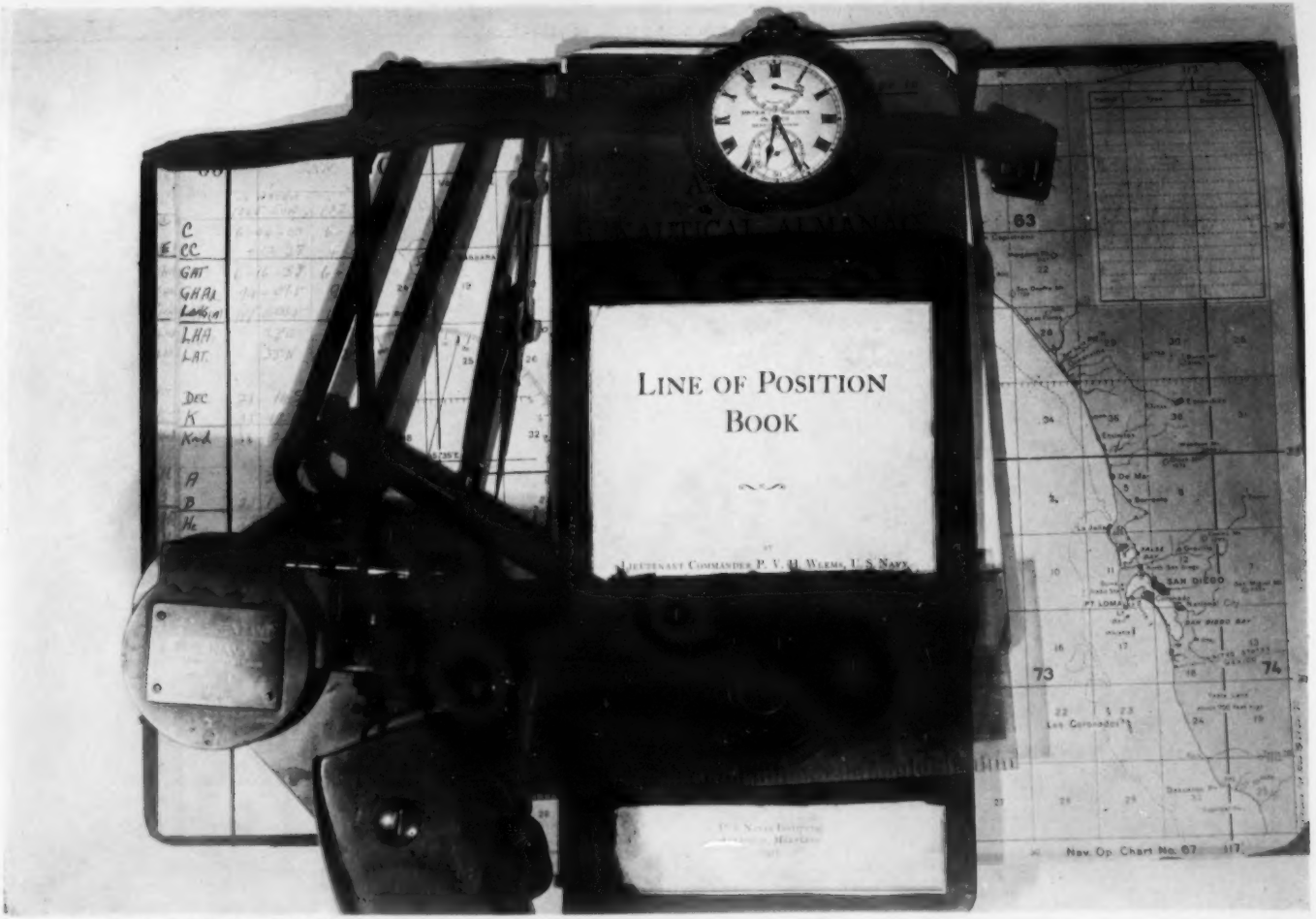
Watch	4-12-23
Watch correction	(+)23
GCT	4-12-51
RAM Sun (+) 12	6-09-47
Table III	0-41.6
GST	10-23-19.6

The watch reading gives the GST to the second, thus saving the time necessary to make the computations, and the chances of error. Why should the navigator be forced to compute the GST each time a star sight is worked, when a watch which will pass railroad time inspection may be rated to keep the correct GST within two seconds per day? There is a real advantage in avoiding the conversion of watch time to sidereal time due to the fact that a large percentage of all errors made in working star sights are made in this operation.

Method.—It is in the method of solution of star sights that we have been able to make the greatest advance. We pay the price of using particular pairs of stars in order to reduce to a minimum the work of obtaining a fix. The method is based on the suggestion of Mr. Hilding K. Beij, of the Bureau of Standards, in Technical Report No. 198 of the National Advisory Committee for Aëronautics. The basic idea is that the simultaneous altitudes of two stars definitely determines a position on the earth, and that curves plotted against latitude and LST may be drawn to represent the altitudes from which a fix is obtained. Figure 4 will show a sample page of the curves. The latitude scale of the completed curves will be that of the Mercator projection, which makes it possible by drawing in the longitude lines to lay down courses and bearings as on a Mercator chart. Or by using a strip map machine, the longitude lines may be etched on the transparent cover, giving in effect a plotting sheet.

Fig. 4 shows some sample sights worked out by this method. Since the intersection on the curves definitely records both the two altitudes and the latitude to scale, it is not necessary to write down these values. Absolutely the only computations necessary for obtaining a fix after the observations are made, is the subtraction of LST from GST to get the longitude. The watch reading is the exact GST, and the intersection of the altitude curves for the observed altitudes projected vertically to the top or the bottom scale gives the LST. If the sextant has no IC, the sextant reading of the bubble sextant is used directly on the curves, since the bubble correction is incorporated in the construction of the curves. On a test of the method, two altitudes were observed, the time of one noted, and a fix obtained in fifty-five seconds, and as it happened this particular fix was correct in latitude and only one minute of longitude in error. The average error from the ground using the bubble sextant and single observations should be not more than three miles, and in the air this average error should not be over ten miles. However, the average error in the air depends almost wholly on the conditions of the air.

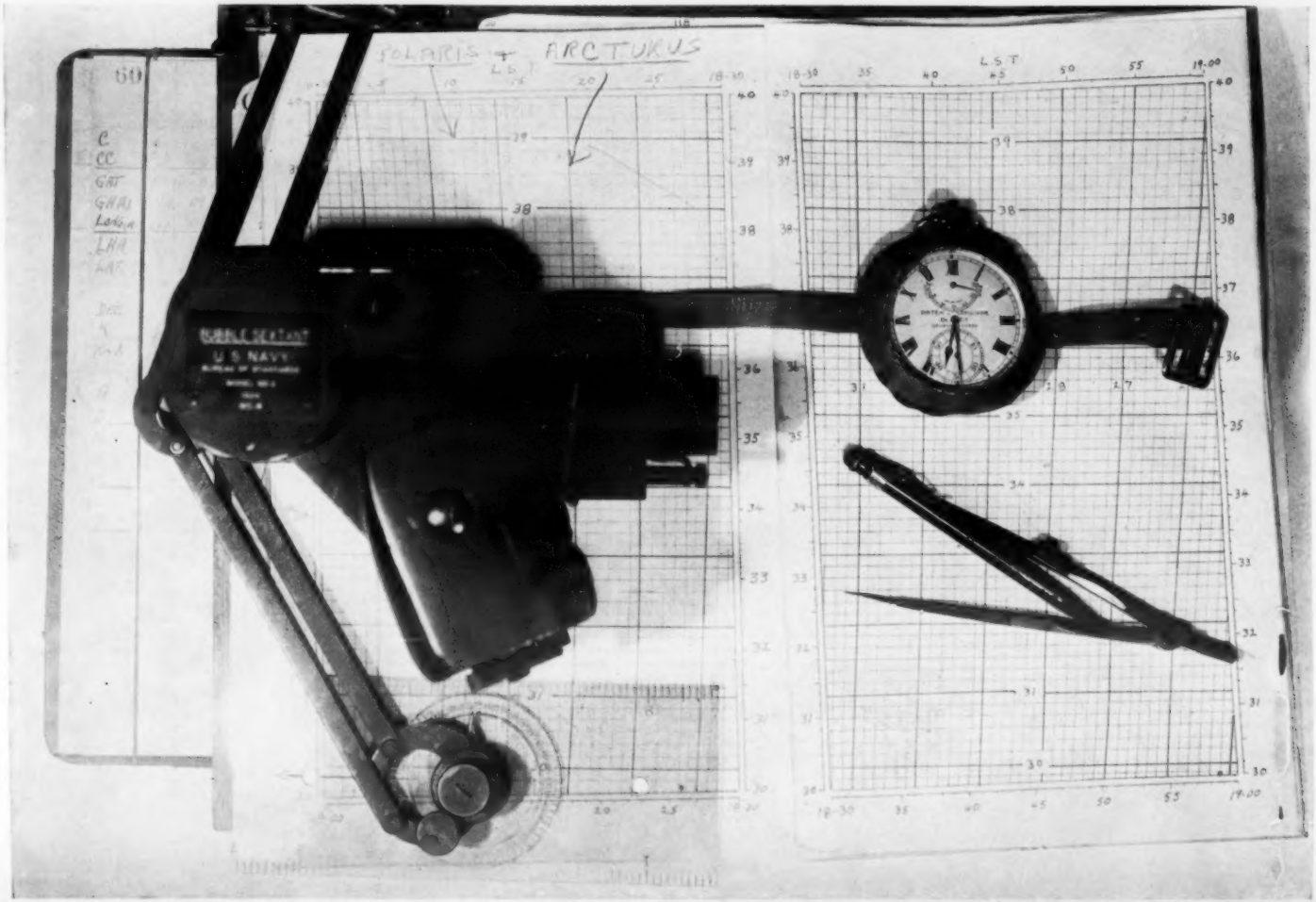
Since it takes about as long to determine the drift as it does to get a star fix by this new method, why not use a succession of fixes to determine the course and speed made good, and hence the drift and the course to steer? And further, since the methods given in the *Line of Position Book* and for using the star-altitude curves do not require a profound knowledge of astronomy or of mathematics for a correct solution, why not make our future textbooks on aërial navigation so easy to understand that the thousands of young men who are now taking to the air will welcome rather than shun aërial navigation?



Courtesy Lieut. Comdr. P. V. H. Weems, U.S. Navy

FIG. 1. EQUIPMENT USED FOR DAY WORK

Sextant, watch, line of position book, nautical almanac, work book, chart, drafting machine and board, dividers and pencil.



Courtesy Lieut. Comdr. P. V. H. Weems, U.S. Navy

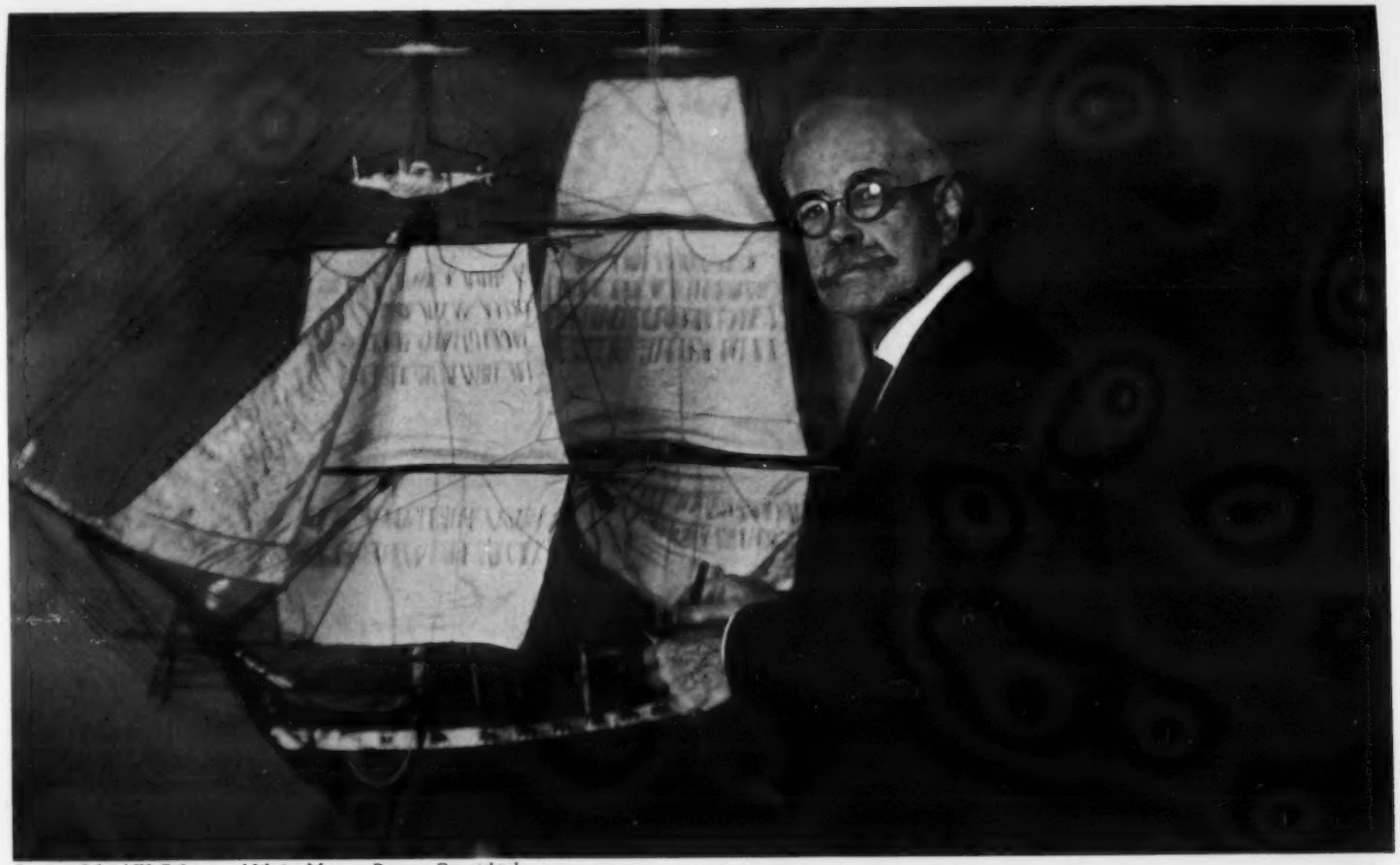
FIG. 3. EQUIPMENT FOR NIGHT WORK

Sextant, watch, star altitude curves, dividers and pencil. The work book, chart and drafting machine are not required.

Courtesy Lieut. Comdr. P. V. H. Weems, U.S. Navy

FIG. 3. EQUIPMENT FOR NIGHT WORK

Sextant, watch, star altitude curves, dividers and pencil. The work book, chart and drafting machine are not required.



Courtesy Colonel W. F. Spicer and Marine Museum, Boston. Copyrighted

COLONEL WILLIAM F. SPICER

Shown here with his second model of the frigate *Constitution* which he completed shortly before his death, August 10, 1928. This and some thirty other models were presented and installed in the new Model Gallery of the Museum of Fine Arts, Boston, by Mr. J. Templeman Coolidge. (See Secretary's Notes)

Courtesy Colonel W. F. Spicer and Marine Museum, Boston. Copyrighted

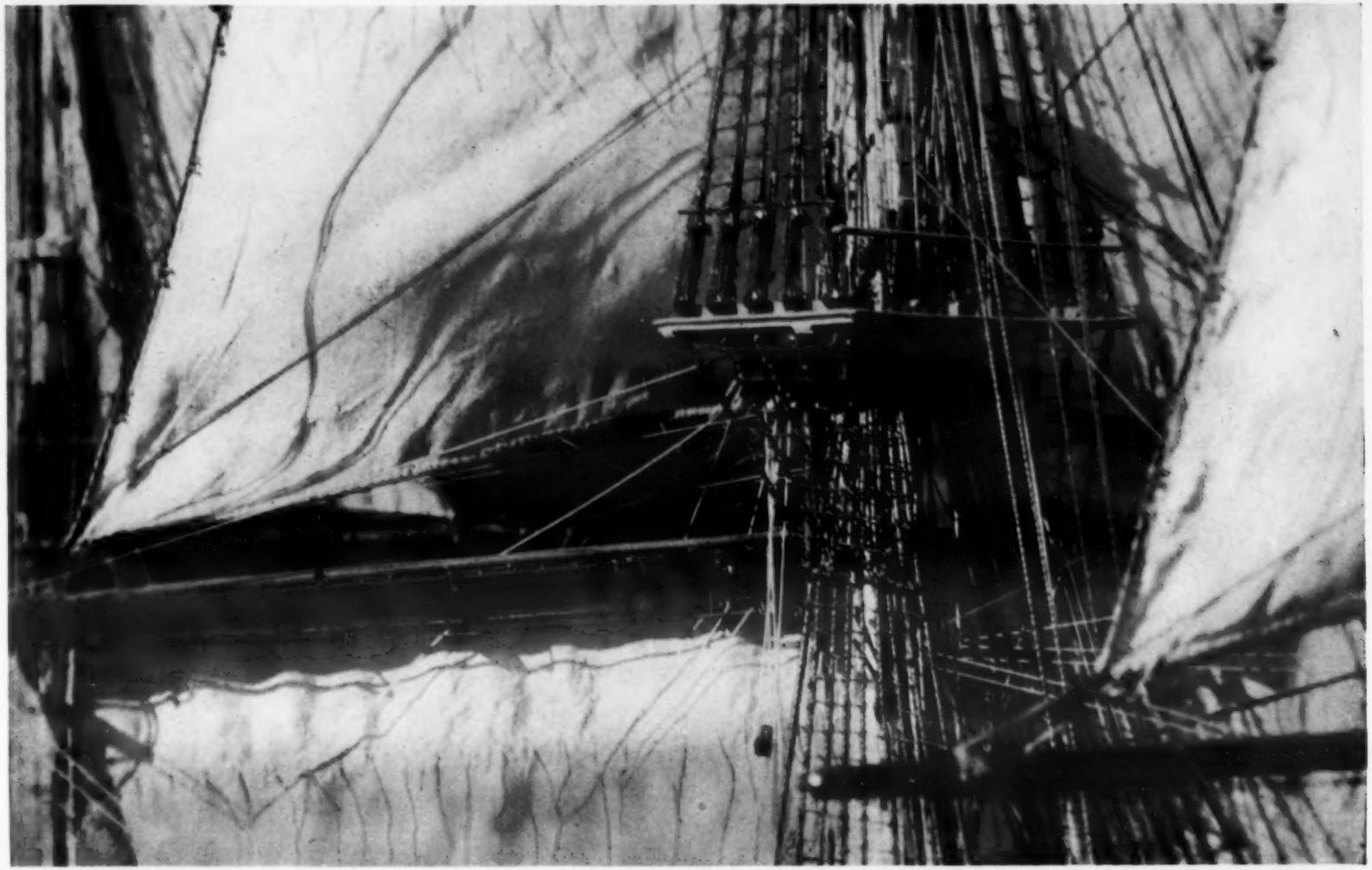
OLD IRONSIDES COMING INTO PORT

Colonel Spicer's model in a heavy blow. (See Secretary's Notes)

OLD IRONSIDES COMING INTO PORT
Colonel Spicer's model in a heavy blow. (See Secretary's Notes)

Courtesy Colonel W. F. Spicer and Marine Museum, Boston.] Copyrighted

OLD IRONSIDES IN LIGHT AIRS
Colonel Spicer's model. (See Secretary's Notes)



Courtesy Colonel W. F. Spicer and Marine Museum, Boston. Copyrighted

THE MAIN TOP

Showing details in Colonel Spicer's model of the frigate *Constitution*. (See Secretary's Notes)

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THE MAIN TOP

Showing details in Colonel Spicer's model of the frigate *Constitution*. (See Secretary's Notes)

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THE MAIN CHAINS

Showing details in Colonel Spicer's model of the frigate *Constitution*. (See Secretary's Notes)

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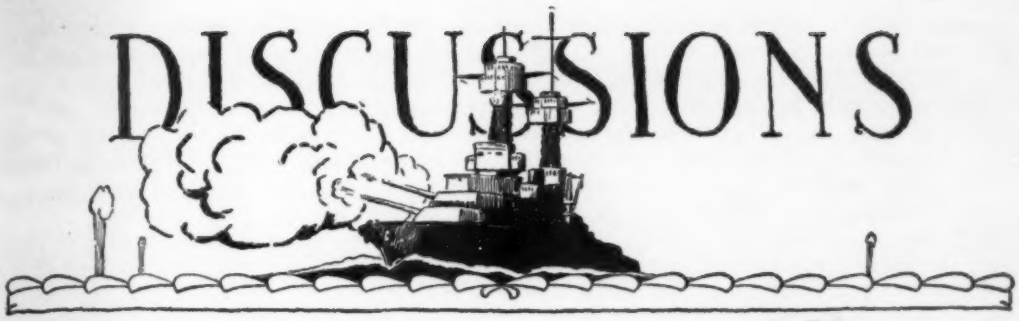
OLD IRONSIDES BECALMED

Colonel Spicer's model. (See Secretary's Notes)

DISCUSSIONS



A Naval Research Reserve

(See page 976, November, 1928, PROCEEDINGS)

COMMANDER W. W. BRADLEY, JR., *U. S. Navy.*—The idea of a naval research reserve, or a technical reserve, or a reserve of specialists, has been under discussion many times in the past. Captain McDowell gives a somewhat different angle than is usually presented and develops his idea of *research* rather fully.

In commencing a discussion of this subject, it may be well to remember that the Navy now has a reserve of specialists, an integral part of the Naval Reserve, known generally as special-service officers. Each of these officers is selected from citizens "prominent in their profession" and, as such, may be expected to be ready to perform expert duty in his own particular vocation. The field covered by these specialists is very broad, practically every corps having one or more classes among them. With a few restrictions in rank, etc. (in order to secure needed conformity), the various bureaus, independent offices, and district commandants have been given a free hand to develop the specialists each will need in case of war. The results have been gratifying, but there is still a large field open for future development and there is plenty of opportunity for those scientists who possess the necessary qualities, and wish to associate themselves with the Navy in a volunteer capacity.

One may note that our present groups of special-service officers are not called upon to perform any duty in time of peace, except under exceptional circumstances. This is for two reasons: first, that those best qualified in civilian life are so busy with their own important and perhaps lucrative work that they do not want to perform any active duty and would not accept a commission in the reserve if any such duty were in prospect as a requirement; and second, that we have no funds provided for their employment. In general, the type of specialist we wish is enjoying so large an income that the question of pay or active duty need not be considered.

As I understand Captain McDowell's idea, he would go further and provide for a group of research workers. I doubt the workability of the scheme, simply on account of lack of funds to pay the personnel involved. At times an enthusiastic investigator will labor without pay even for an extended period, but his enthusiasm eventually dies out, and then the whole work comes to a halt, usually amid demands for assistance and grumbling which overthrow all the good he has accomplished. Every organization which has tried to get ahead on a non-pay status—except in great emergency when the average man or woman will sacrifice much for the common good—has come to a halt and had to cease operations or pay its workers.

Unless the proposed research reserve were composed of a reasonable number of investigators it could hardly be classed as a reserve, but would be simply a few specialists who might as well be employed in a civil capacity without the necessity of carrying them in any form of a naval reserve.

In a discussion of this sort we might as well get down to brass tacks—get past generalities. It may be noted that Captain McDowell's article (like the greater number of suggestions of this kind) omits any definite statement as to whether the specialists he contemplates having enrolled in the proposed research reserve will be on a non-pay, partial-pay, or a full-pay status. Without such

information it is difficult to comment on the real intent of the proposal.

If the proposed research reserve is to be conducted wholly on a non-pay basis, the writer, as previously stated, believes it would be practically worthless, since few men of worth-while attainments can be found to continue investigations without some financial return for their services.

If the work is to be conducted on a partial-pay basis it might be successful to a limited degree, depending upon the amount of money available and the character and ability of the research workers employed.

If it is to be on a full-pay basis, it would undoubtedly prove of benefit to the Navy; would require the complete time of a number of research workers; and would involve a considerable expenditure for salaries, equipment, etc.

In any case, there could be no real advantage in commissioning the personnel in the Naval Reserve. They might better be kept in a civil status, where the government would be free from future complications regarding pensions and retirement; where the total pay involved would probably be less than on a commissioned status; where there would be no bothersome questions of rank involved; and where the necessary funds would be chargeable to the projects to which they rightfully belong, instead of to the appropriations for the pay of the Navy.

The real facts, as seen by this writer, are that if any commensurate gain will result to the Navy from the conduct of research work such as that contemplated in Captain McDowell's article, the employment of the needed workers should be authorized by Congress and the necessary funds appropriated therefore, but that this distinctly civil function should not be tacked on to the commissioned personnel of the Navy or the Naval Reserve, nor should funds for its performance be charged to the pay of naval personnel. It is a matter for the material bureaus of the Department to take under advisement—separate and distinct from the naval reserve—as a part of legitimate activities of their civil personnel. This is now recognized by Congress by the inclusion in the annual appropriation bill for the Navy of the following words "for payment of part time or intermittent employment in the District of Columbia, or elsewhere, of such scientists and technicists as may be contracted for by the Secretary of the Navy in his discretion at a rate of pay not exceeding $20 per diem for any person so employed."

Torpedo Fire from Surface Craft

(See page 1051, December, 1928, PROCEEDINGS)

BROCKHOLST LIVINGSTON.—Lieutenant Krause's article on torpedoes is very interesting since it deals so completely with its subject. The torpedo *is* an offensive weapon which makes it advisable that it be carried as an independent weapon by a special class of vessel. The destroyer and submarine (operating in different planes) are the two classes which should be fitted with torpedo tubes. The battleship should certainly no longer be encumbered with this weapon, and the cruiser might well have its tubes replaced with additional antiaircraft guns.

I agree with Krause when he says that the aircraft carrier should not carry tubes. However, is he right when he says the *Lexington* does not mount them? I have seen that this carrier was designed to be fitted with two twin and, again, two triple, above-water tubes. Certainly if our new carriers are not even to carry *offensive guns,* they should not be cluttered with offensive torpedoes. In fact, it would take a great stretch of the imagination to visualize any situation in which the carrier could make use of torpedoes.

To mount tubes on cruisers to be used in such unsportsmanlike situations as the *coup de grace* given the *Blücher* by the *Arethusa,* is making poor use of valuable space.

One can only conclude that the destroyer on the surface and the submarine beneath the surface are the two classes which should be fitted with torpedo tubes. The mere chance of other classes being in a position, *at some time,* to make use of torpedoes does not warrant their being carried. As in the case of cruisers, space, especially since the Washington conference, is much too precious to fill with weapons of *possible* value.

The United States Navy and 104 Years of the Monroe Doctrine

(See page 1067, December, 1928, PROCEEDINGS)

BROCKHOLST LIVINGSTON.—In Lieutenant Commander Dunn's splendid paper on this subject, he states: "Nor has our Navy ac-

complished its various missions related to the Monroe Doctrine . . . . without its consequent sacrifice in life, treasure, and ships. There was the destruction of the *Maine* . . . . and the phantom-like disappearance, without trace, of the *Cyclops,* during her fateful trip from Rio de Janeiro during the World War." I am afraid the disappearance of the *Cyclops* cannot be blamed on the carrying out of one of our Latin-American policies as—to the general public—she was engaged in the humble yet worth-while occupation of carrying manganese ore from Brazil to the United States, when she met her untimely and mysterious end. She did, however, have on board a number of naval prisoners from the *Pittsburgh* (Admiral Caperton's flagship), and also Mr. Gottschalk, the consul general to Rio, but, even so, it seems to me her connection with our Latin-American policies was rather distant.

It would seem decidedly uncalled for to bring this slight mistake to light when the rest of the paper is so excellent were it not that I would rather have the *Cyclops'* loss credited to the realm of logistics (a pet of mine), which I believe it can be, than to this pet subject of Commander Dunn's.

"We Will Do Our Best"

(See page 979, November, 1928, PROCEEDINGS)

LIEUTENANT W. A. P. MARTIN, *U. S. Navy.*—The following remarks may be of interest as an addendum to the article entitled, "We Will Do Our Best," by Captain Smith, U. S. Marine Corps.

THE INTERNATIONAL GUN

On the left hand side of the roadway leading to the Armory, on the side toward the superintendent's house, there is a small gun, a 1-pounder muzzle-loader, two-inch bore, the barrel three feet in length, which bears the tag: "International gun—used against Boxers by besieged Europeans and Americans, Pekin, 1900."

Remembering that I had seen an account of this gun before, I searched and found the following in Martin's *Siege in Pekin:*

> Hitherto we had nothing with which to reply [to their fire] larger than a machine gun. The want of heavier metal was deeply felt, and one of our marines (American), Mitchell by name, aided by an ingenious Welshman named Thomas, undertook to construct a cannon out of a brass pump—putting two pieces together and wrapping them with steel wire somewhat as Milton describes devils as doing in the construction of a cannon out of a hollow pine. Before it was completed, however, Sir Claude* forebade its use, saying that to keep the pump to meet a possible conflagration was of far more vital importance.
>
> Luckily, while this work was going on the gunners were informed by a Chinese that in an old junk shop within our lines he had discovered an iron cannon of considerable size. It was brought in and examined and found to be Chinese though at first it was supposed to be of English make. So good it was that they resolved immediately to rig it for use.
>
> Mounted on an Italian gun carriage and provided with Russian bomb shell it became useful to us and formidable to our enemies.
>
> The Russians, though bringing ammunition, had forgotten their gun. The Italians, I presume, had found theirs too heavy and had brought the empty carriage. Put together and served by American and British gunners it was not unfitly christened the "International." It led the way in many a sortie, prostrating barricades and frightening the enemy by its terrible thunder. But, however, being a breech-loader, and the ammunition being ill-adopted, it was inconvenient to handle.

Gyroscopes and Satellites

(See page 17, January, 1929, PROCEEDINGS)

MR. R. F. DEIMEL, Sperry Gyroscope Company, Inc.—Mr. G. L. Dillman's article on "Gyroscopes and Satellites" in the January number of the United States Naval Institute PROCEEDINGS is incorrect on a grand scale. Since it appeared in a technical journal, the layman may need to be reminded that all he sees in print is not necessarily true. For this reason a few of Mr. Dillman's misconceptions will be mentioned; the article, however, does not warrant a detailed refutation.

The "Law of Satellites" is absurd. The "fact" on which it is based does not exist. A gyro supported at its center or mass, but otherwise unconstrained, will *not* change the orientation of its axis with respect to the fixed stars, regardless of the motion of its center of mass.

The paragraphs headed "Physical Analysis" are based on a misunderstanding of the laws of dynamics. The mass of a body cannot be considered as concentrated at the "center of gyration," nor, indeed, at the center of mass. The term "revolution," as used in the article, is not clearly defined. The motion of a body consists of rotation,

* Sir Claude MacDonald, British minister to China and, during the siege of the legations, in general charge of their defense.

translation, or both. If the axis of rotation is taken through the center of mass, the rotation and all gyroscopic phenomena will be independent of the translation. That is, the motion of the center of mass has no effect on the magnitude or direction of spin of the body.

In the paragraphs "Visual Proof" Mr. Dillman falls into an easily avoided error. When the gyro has true gimbal support, and when there is only negligible friction at the trunnions or gimbal pivots, the axis of the gyro does *not* become perpendicular to the plane in which the center of the gyro moves. This is a routine classroom experiment familiar to students of mechanics.

The proposal to make a gyro compass with its axis parallel to the earth's axis is neither very valuable nor very new. Even in a laboratory—much less on a vessel that is changing its latitude—the axle of such a gyro wanders from its initial position on account of friction. To restore the axis to its proper position, therefore, requires the use of a device that automatically indicates latitude. Such a device can be made, but it must include an auxiliary gyro compass to indicate the meridian. Thus we have a vicious circle.

In existing types of gyro compasses—none of which tilt at the latitude angle—damping is essential, unless navigators can be persuaded to use compasses that do not point north.

Mr. Dillman's astronomical argument is just as easily annihilated. The change of obliquity of the ecliptic is the change of the plane of the earth's orbit—not its axis—relative to the fixed stars. It is independent of the earth's spin and is produced by the perturbations of the whole solar system. It has no relation to the precession of the equinoxes. Although the obliquity is now changing at the rate of forty-seven seconds a century (roughly "1° in 6,870 years"), it has not always varied at this rate. The rate of variation is decidedly complicated and does not follow the simple sine law guessed at by Mr. Dillman. Astronomers believe that the change cannot exceed 3° in a million years. This will make the angle between the ecliptic and the earth's equator about 30°.5—somewhat less than "179° 30′. Date 1092000 B.C."

International Newsreel

GIANT PASSENGER PLANE MAKES SUCCESSFUL FLIGHTS

Photo shows a view of the *Chapman*, 20-passenger air liner. It was built by P. W. Chapman, financier, from designs by V. J. Burnelli. It has a wing span of 80 feet, fuselage overall 47 feet, a speed of 145 miles per hour, and a cruising radius of 4,000 miles. It is radio equipped and has every modern traveling luxury.

International Newsreel

THE FLEET WITH ITS SEAGOING HANGAR

Remarkable view of the U.S. Battle Fleet from the U.S.S. *Saratoga* during the naval maneuvers off the Panama Canal. Note airplanes lined up on the *Saratoga's* deck.

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Remarkable view of the U.S. Battle Fleet from the U.S.S. *Saratoga* during the naval maneuvers off the Panama Canal. Note airplanes lined up on the *Saratoga*'s deck.

GREAT BRITAIN

New Cruisers

Naval and Military Record, January 23.—The present spring will witness an important addition to our strength in cruisers in full commission. The *London* is now completed for service at Portsmouth. The *Devonshire,* having successfully carried out her sea trials, is due for completion at Devonport by about the end of March. The *Sussex,* which has likewise carried out her trials, will also be ready for the pennant much about the same time. These three vessels are destined for the First Cruiser Squadron in the Mediterranean, which is temporarily reduced to three ships in anticipation of their joining. The *London* will leave early in February, and replace the *Frobisher* as flagship. When the other two cruisers join the squadron the *Frobisher* will return to Plymouth to pay off and be taken in hand for a big refit. Her disposal after this has not yet been definitely decided upon, but it is expected that she will rejoin the First Cruiser Squadron so as to maintain, as nearly as possible, the homogeneity of that force. It is not generally known that the *London* group of cruisers are more powerfully engined than the *Kent* class, which were the first of the 10,000-ton post-Washington cruisers, and are nearly a knot faster in consequence.

With the addition of these three ships to the Mediterranean Fleet, and including the two new Australian vessels of corresponding type, the Navy of the Empire will have ten 10,000-ton cruisers in commission. France has three, Japan and Italy two apiece, and the United States none as yet in commission. We have four more cruisers completing afloat and the *Exeter* building at Devonport. On the other hand, the United States has eight cruisers on the stocks, Japan four, Italy and Spain two apiece, and France one. As against the much-talked-of United States program of fifteen 10,000-ton cruisers, our five-years' replacement program still provides for the construction of five cruisers, irrespective of the three which the Cabinet deleted a year ago. Probably all these vessels will be of the "B" class, of 8,400-tons. If, and when, the United States completes her projected program, the respective positions in post-Washington cruisers will be: Great Britain, 20; the United States, 23. We shall remain stronger in pre-Washington cruisers, and the four *Frobishers* and two *Emeralds* are very valuable vessels. It is believed that the American vessels will aim at a much higher speed than our own corresponding types, rumor crediting them with 36 knots as against an average of 31 knots. This, however, scarcely seems consistent with the plea of the Navy Board for the maximum of cruising endurance.

Launch of H.M.S. Dorsetshire

The Engineer, February 1.—At Portsmouth on Tuesday the launch took place of H.M.S. *Dorsetshire,* the eleventh and last of the 10,000-ton cruisers laid down for the Royal Navy since the Washington Conference. This vessel, with her sister ship *Norfolk,* which went afloat from the Fairfield Company's yard at Govan on December 12, constitutes a new class, differing in minor but not unimportant respects from the five *Kents* and the four *Londons.* The *Norfolk* group would probably have numbered four units but for the deletion of two 10,000-ton cruisers from the quinquennial building program, one being dropped in 1927 and the other from the 1928 Navy estimates. A ship of the same, or perhaps an improved, class is projected for 1929-30. Authorized in the estimates for 1926, the *Dorsetshire* was begun on September 21, 1927, and has thus been over sixteen months on the slipway. She has an extreme length of 633 feet, a beam of 66 feet, and a mean draught of 16½ feet, the standard displacement being 10,000 tons. Her steam turbine machinery, built by Cammell Laird and Co., develops 90,000 S.H.P., the contract speed being 32 knots. Yarrow type boilers are installed. For cruising purposes the vessel is equipped with internal-combustion engines, the design and power of which have not yet been disclosed. The fuel-oil capacity is 3,400 tons, sufficient for a voyage of 10,400 miles at speeds between 11 and 14 knots. No bulges are fitted to the hull, but their omission, it is understood, has been compensated for by improved methods of internal subdivision. Like her immediate forerunners of the *London* group, the *Dorsetshire* will carry a seaplane, together with catapult projecting gear and twin derricks for hoisting the machine inboard. The armament, eight 8-inch turret guns, four 4-inch antiaircraft, and eight torpedo tubes

on quadruple mountings, is similar to that of the earlier *County* ships.

American Naval Policy

Naval and Military Record, February 6.—The Naval Board of the United States has issued a statement of the naval policy of that country which is enlightening as far as it goes. It lays down that "the fundamental naval policy of the United States is that its Navy shall be maintained in sufficient strength to support United States policies and commerce and to guard its continental and overseas possessions." There is a spaciousness about this declaration which defies definite measurements. Germany wanted a Navy to "support her policy," which was to conquer Europe. What we want is a definition of policy before we can form an estimate of the real significance of any standard of naval strength. America seems to have done very well and to have supported her policies quite successfully since, let us say, the end of the Civil War, on a smaller navy than that of Great Britain and, for a very considerable period, of France and Germany. Why then has she lately discovered that she must have a very much bigger Navy? Is it illogical, in face of the Naval Board's statement, to attribute this to an idea of more ambitious policies not so palatable to the rest of the world as to be independent of the "moral backing" of armed force?

Of course, the Naval Board's statement was drafted before the ratification of the Kellogg Pact, under which America pledges herself to renounce war as an instrument of national policy. The Board, however, is not likely to be influenced in its professional outlook by this ratification, since it refers to the "hope that the Powers will agree to limitations of naval strength," but adds that the naval needs of the country will not be affected by any agreement. Put in plain English, it is America's intention to become the strongest naval power in the world, and, as there will be no competitive effort anywhere against this, she will have no difficulty in realizing her ambition, at any rate as far as ships are concerned. Unless she contemplates new policies we are still left guessing at the real meaning of it all. And the idea of new policies involving a much larger relative measure of armed strength does not altogether seem to harmonize with the spirit of the Kellogg Pact.

When we referred to the Naval Board's statement as "enlightening" we meant on the material side. We are told that all old cruisers are to be replaced by new vessels of 10,000-tons displacement, carrying 8-inch guns, and that a sufficient surplus of these will be built to insure "an effective cruiser tonnage in conformity with the capital ship ratio." This reads like a proposal of extraordinary extravagance. To employ a big, costly ship in the numerous functions which can be quite as well—probably often better—discharged by a small ship, is an inversion of all strategical and tactical doctrines. If all the old cruisers in the United States Navy are to be replaced by 10,000-ton vessels, her admirals will have no choice in the matter. If she aims at parity in tonnage with ourselves, it is very clear that she must be satisfied with much fewer vessels. If she aims at parity in numbers she will be committing her leaders afloat to the principle of breaking butterflies on wheels. On our part we have been through a similar phase, and realized the folly of it. We built protected cruisers up to 14,000 tons *(Powerfuls)*, and armored cruisers even bigger *(Shannons)*, and then we came to battle-cruisers and said we should not build any more "little bandboxes."

The cult of mere bigness appears to be very strong in the United States Naval Board. If money is no object and if a 10,000-ton cruiser can be sacrificed as lightly as a 5,000-ton ship, then the cult may be justified in other directions. Of course, the naval needs of the United States are very limited, geographically, as compared with our own. Why she lays so much insistence upon the necessity for the utmost possible radius of action as alone worth the price of maximum size is not altogether clear in connection with "defensive needs." Our own Admiralty has decided not to complete the proposed program of "A" cruisers (10,000 tons) but to substitute "B" cruisers (8,400 tons) in their place, and our defensive needs manifestly demand the utmost capacity of sea-keeping endurance. We observe that the Naval Board refers to "plans for the rapid conversion of suitable mercantile vessels into aircraft carriers." In the event of war America could spare all her "suitable mercantile vessels" for com-

batant purposes, whereas we should then most need ours in order to maintain our national life.

Germany's Naval Policy

Naval and Military Record, January 30.—The decision to lay down a 10,000-ton cruiser, confirmed only after a very heated political wrangle, serves to draw attention to the general question of the naval policy of Germany. The vessel, officially known as *Panzerkreuzer A,* is the first of six ships allowed to Germany under the treaty terms of progressive displacements of the six pre-*Dreadnought* battleships she was permitted to retain. Since she is building one it is reasonable to assume that she will build the other five instead of devoting the tonnage allowance which they represent to any other type of surface ship—submarines being prohibited to her. It is clear that, upon her severe limitations, the Fatherland can only follow a purely defensive policy. This reduces itself to the most effective means of coastal defense. A new feature enters into this question, since Germany now has a broken coastline in the Baltic owing to the "Danzig Corridor," and therefore has to consider the question of guarding the communication between the two sections in the event of a war which might involve hostile occupation of the intervening sector. Naval opinion in Germany is strongly divided upon the matter of the most effective type of warship to meet this situation.

For purely coastal defense purposes a 10,000-ton monitor, carrying four very heavy guns in two turrets, of limited radius but of good speed, would appear to be the best choice. But Germany must not mount anything heavier than 11-inch guns according to the Allied view of the treaty terms, so long as these continue in force, although apparently she had not realized this armament limitation until the point was raised not very long since. It is quite practicable to construct an 11-inch gun which would outrange any existent naval weapon and throw a projectile of 1,100 pounds with a pretty useful devastating capacity. But the Naval Staff are very reluctant to materialize the new sea power of Germany in vessels designed for local defense only. German naval opinion has always run in favor of smaller calibers and higher velocity, probably under the *ægis* of Krupp, and one of the unpleasant surprises of the early stages of the war was the degree in which enemy naval artillery of practically corresponding types outranged our own. The first business of all in naval gunnery is to be able to hit; it is quite useless to have the power to deliver much heavier blows if you cannot get inside the longer reach of of a lighter adversary, and this is what frequently happened in 1914.

The armored cruiser has therefore been decided upon as the best substitute for the battleship in the restricted reconstruction of the German Navy—a decision which may but prove an intelligent anticipation of what the great sea Powers will presently do. The precise pattern of gun to be mounted in the new vessel has not been revealed, but we may gather something concerning it from a comparison which was drawn by General Groerner (the Minister of Defense) in a review of the salient features of the *Panzerkreuzer A.* He said that she will be able to deliver three times the weight of metal in one minute as the *Elsass* battleships to be replaced, which are armed with four 11-inch and fourteen 6.7-inch guns, and that she will outrange these by more than seven miles. Even for coastal defense alone, therefore, they will have a considerably higher value than the bigger-gunned battleships. We have long known that German naval designers are masters in the art of getting the very fullest value out of displacement, and from all accounts they have well lived up to their record in the plans of the new 10,000-ton cruiser.

The Deutsche Werke, at Kiel, where she is being built, are using in her construction metal said to be one-third the specific gravity of steel and which has successfully passed most drastic experiments. Such a saving in weight opens great possibilities. The *Panzerkreuzer A* will be exceptionally protected, including an anti-aircraft deck. No bulges are being used for defense against torpedo attack, but the ship will be honeycombed with watertight compartments. Nothing has been officially vouchsafed about her speed and radius of action, probably because Germany has a free hand in these matters and does not choose to tell the world what she proposes to do. Vessels of this type are clearly suited to world-wide service, and this idea is at the back of the policy which has decided upon them.

There is little question that, had Germany been free to do so, she would have built big submarine cruisers in preference to any other type. Such craft would best meet her defensive needs in view of the severe restrictions placed upon her sea power.

FRANCE

French Naval Policy

Naval and Military Record, January 23, by J. B. Gautreau.—Minister Georges Leygues, through hard work and superior personal prestige, is having everything his own way in Parliament and in the country and steadily bringing the Marine Française to a degree of defensive efficiency it had not yet attained under the Troisième Republique. The "loi des Cadres de la Marine," or Chart of the Officers' Corp, has been voted by the Chamber, and also the shipbuilding program for 1928-1929, providing for sixteen fighting units. "So long as I am in charge of the Navy," quietly declared Minister Leygues, "France will keep the same building rate, because she is a soverign State well knowing what is good for her, and because, also, she leaves other nations perfectly free to look after their defense in their own way." Not defiance, but watchful defense is his motto.

"Les Flottes de Combat en 1929," the official publication just issued of the Paris Admiralty Staff (Société d'Editions Maritimes, 184 Bd. St. Germain), marks a notable improvement on previous similar volumes, containing innovations and information on many points of interest to naval men. The British Navy is shown to lead the way in every respect, counting 1,227,000 tons (2,000 tons more than America). It is the only fleet that has got rid of all obsolete tonnage on its official list, with the result that the British superiority is greater than appears on paper and amounts to 230,000 tons over the United States (efficient tonnage being alone reckoned. The total warship tonnage for America, including obsolete and building ships, is 1,225,000 tons. Japan comes next with 737,000 tons, comprising only 50,000 tons of ships above the age limit, which brings Japan nearer to America's strength than had been arranged at Washington. France has 467,000 tons of warships including 150,000 tons of obsolete tonnage and 100,000 tons building, which leaves the efficient available Flotte Française at under 220,000 tons, thus little under one-sixth of the British Fleet—a proportion of inferiority to which France has seldom come down in the past. Italy is relatively stronger; her 318,000 tons only comprise 60,000 obsolete tonnage, as the consequence of energetic discarding measures in 1928, and she has about 50,000 tons building. Russia boasts of 172,000 tons, half of which is obsolete and, it is presumed, in poor condition. Spain has 115,000 tons, of which 30,000 tons are building. Germany has 108,000 tons, mostly obsolete, but modernized as much as technical skill can do. In real power Germany ranks immediately after Italy. France at the present moment is the country having the greatest number of units of the defensive class on the stocks, Great Britain and America leading in cruiser construction.

Global figures of tonnage are misleading if taken as expressing the relative fighting capabilities of the various Powers. Thus Great Britain, although easily first in material strength and in efficiency, could not strike with her full strength on any given strategic point, for the reason that her vital interests are world-wide and that her political heart is in Europe, surrounded with dangerous rivals, some of them on positions of vantage across her most important lines of communications. America is better off in that respect, having no potential enemy worth her steel within 3,000 miles, and, on the other hand, being so huge and with resources so great that the hardest surprise blows could not be fatal to her. Still, her very immensity means strategic weakness, and her Panama Canal communications would be precarious in wartime if opposed to a first-class and determined enemy. Strategically speaking Japan is the most favored: she could strike with her full might in Far Eastern waters.

But of all Powers France is strategically laboring under the greatest disadvantage. The united French Fleet is vastly superior to the Italian and, compared with the postwar German naval force, it enjoys crushing advantage. The misfortune is that France has to defend shores and ports so far apart as Dunkirk and Nice, and Bizerta and

Gabès, and separated by a narrow gate, viz., the Gibraltar Straits. Post-war conditions render her situation worse. The next time blows will be swift and crushing, and it would be futile to expect the Channel Fleet to arrive in time to rescue the Toulon Escadre de Combat. Moreover, against a Mediterranean enemy it is as well to take it for granted that the Gibraltar gauntlet will never be rushed quite without losses, and, of course, it would be impracticable if Britain were the opponent. Last war data are nothing to go by in that respect, German bases being too distant for effective interference with the safety of the Gibraltar passage. Therefore, as a consequence of her geographical situation, that is so favorable to commercial pursuits, France is sorely handicapped and obliged to keep two fleets, wholly distinct, and that would be obliged to rely on their sole forces in war in most cases.

The Brest Deuxiéme Escadre (Rear-Admiral Le Dô) will comprise in 1929 the obsolete ex-German cruisers *Strasburg, Metz,* and *Mulhouse,* credited with 26 knots on paper, but only good for 22 knots at sea, and mounting pre-war guns of limited range, besides the 2,400-ton and 35-knot *Leopard* and *Lynx,* and 12 torpedo-boats and 7 submarines, all more or less obsolete. This would be a poor force to oppose to the four new 29-32-knot light armored cruisers *Embden, Koenigsberg, Karlsruhe,* and *Koeln,* and to the twelve 800-ton and 33.4-knot *Moewes,* without mentioning the modernized battleships, cruisers, and torpedo-boats that have been recuperated from the pre-war Kaiser's Armada. Her own submarines would be the only point of vantage for France, although it is the opinion of many Allied observers that the German-trained specialists would be somehow in possession of underwater weapons soon after the declaration of hostilities. France under such conditions could do little more than defend her coasts, but Germany would command the high sea and cut communications between France and her colonies, which would reduce considerably French capabilities for resistance. To fully account for the German Fleet such as it will be in 1929-1930 the presence in the Channel would be required if practically the whole of the French modern cruiser force, or at least of one *Tourville* and of the three 8,000-ton cruisers that individually are not, outwardly, more than a match for the excellent 6,000-ton (nominally) new cruisers of the Fatherland.

Thus, to guard herself against the German danger—and a real danger, too, when are considered surprises in store in Poland and Austria—France would be under obligation to withdraw all, or nearly all, her post-war cruisers from the Middle Sea, where Italy would then have on her side, and overwhelmingly so, that capital asset of victory that resides in combined superiority for calibre and speed. The powerful 36-knot *Trente* and *Trieste,* and 34-knot *Zara* and *Fiume,* of 10,000 tons, supported by the sixteen new light cruisers or super-destroyers of 5,300 and 2,200 tons now building, would more than account for that portion of post-war contretorpilleurs and torpilleurs d'escadre which France could spare for the Mediterranean after providing for Channel and Atlantic needs. This defensive dilemma in which France is geographically placed has to be considered if French naval policy is to be judged with fairness and competence. Of course, the situation was much the same before the war, but then there was the Russian alliance, that appeared to restore something of an equilibrium.

France's situation at sea is being made worse by the energetic rise of the German Navy, that is, after years of silent preparations, making a new bid for sea power with unimpaired resources, much increased shipbuilding capabilities, and a technical and scientific experience second to none, without mentioning the naval traditions that are a treasured legacy of the Great War and are made so much of in the patriotic formation of young Germans. The new German armored cruiser type to which Deputé Lecourgrandmaison called the attention of the Paris Chamber promises to excel anything built in Europe since the war to the exclusion of the *Nelson* and *Rodney,* that are uncontested kings of the ocean. The German 10,000-tonners, mounting six improved 280 mil. guns in stout triple turrets, with exceptional arc of fire and wellnigh proof against bombs, shells, and torpedoes through much screening, subdividing, and armoring of the hull, will carry all this ensemble of fighting advantages at a rate of 26.27 knots over an unprecedented radius

of action (at least for warships). Such Diesel armorclads would "make a mouthful" of the French *Tourvilles* and British *Londons* if they could catch them, and they would give the slip to all *Dreadnoughts*, including the fine British *Queen Elizabeths*, with the exception of the English battle-cruisers against which they could have a say. And the Fatherland, it is said, has greater surprises in store, both in the naval and aërial field, where German engineering skill is quietly asserting its lead over all-comers, to the concern of admiring Gallic observers.

No wonder the project of 20,000-ton croiseurs de bataille to mount eight guns of 12-inch bore (new quickfiring type), and to be an improved and modern copy of the British *Indomitable* class and intended for similar duties, should have been revived and earnestly taken into consideration by the Counseil Superieur de la Marine, so much so that the admirals forming the High Council are reported to have come to a complete agreement over that momentous question, all voting en principe for 20,000-ton armored vessels, "fit not only to run, but also to give and withstand hard blows under the new conditions of war," which is also the raison d'etre of the German armored cruisers. Speed and armament are points on which divergence of views prevails. Similarly, since the creation of the Air Ministry French aviators, formerly so convinced of their all-round supremacy, have become alive to the sad fact that technical and constructional aërial superiority has gone very much to the German side. The knowledge of that situation determined a patriotic and millionaire Frenchman, Monsieur André, to create the epoch-making La Baule aërial contests, open to the world's aviators.

How Speed Governs Mediterranean Strategy

Naval and Military Record, January 30, by J. B. Gautreau.—The French and Italian navies are at present competing hard for speed, as if speed supremacy, so long considered as sheer make-believe, were the true key to the control of the Mediterranean Sea. In the relatively narrow waters extending between Algeria and France, speed combined with aërial supremacy will confer the power of having under permanent supervision the movements of enemy squadrons, flotillas, or convoys, and of assailing them at the opportune moment with superior forces. This is especially true for Italy, that possesses the position of strategic vantage from the fact that communications with Algeria that are vital to France pass within easy striking range of Sicily and Sardinia. For Italy to be able to interfere in a decisive manner with the stream of regular troop and supply convoys between Algiers and Marseilles would in practice be synonymous with victory. On the other hand, if Italian raiding parties, to be keenly watched from both Corsica and Bizerta, were exposed to the danger of being waylaid on the high sea by superior forces, the game would be up for the peninsula, and, indeed, it would never be risked, cautiousness being the outstanding quality of Rome diplomacy.

In the cruiser line France has a marked advantage. Pending the completion of the *Trente* and *Trieste*, the *Tourville* and *Duquesne*, that have done respectively 36.15 and 35.3 knots, would be capable of beating on the high sea anything existing in commission in the Italian Fleet, that does not possess as yet cruisers capable of escaping from the reach of the 33-knot *Duguay-Trouins*. This situation, however, the peninsula is working hard to modify to her advantage. The 10,000-ton *Trentes*, that are the longest ships of their class afloat and the most powerfully engined, ought especially in Mediterranean waters to outdo the *Tourvilles*, whilst the four 5,300-ton cruisers of the *Condottieri* class, designed for 95,000 h.p. and 38 knots, promise to excel all French vessels yet building. This coming inferiority of France will not be retrieved by the 10,000-ton *Suffren*, *Colbert*, *C2*, and *C3*, speed in these cruisers having been sacrificed to make-believe armoring.

Similarly, in the destroyer branch Italy is taking the upper hand. The 26 French *Simouns* and *Forbans*, of 1,390-1,400 tons, 33,000 h.p., and 33-34 knots, are better armed than the Italian *Sauros* and *Aquilones*, and probably better sea boats, too, but they could not catch them save, perhaps, in heavy weather. The 2,160-2,500-ton *Chacals* and *Guépards*, that are good for 35-37 knots and are powerfully armed, have some chance to be excelled for speed by the 12 units of the *Vivaldi* class, of 2,000 tons and 38 knots, now building or completing. Italian experts are devoting to the study of

the speed problem their whole heart and engineering skill, that is second to none, and wonderful results are said to have been obtained with recent restroyers, that have approached forty knots. Moreover, coastal motor vedettes that peninsular specialists are perseveringly improving appear to excel anything obtained in France, whilst it is not secret that Italian flying flotillas, under the able General de Pinedo, enjoy something like supremacy in the Mediterranean.

But the energetic Minister Georges Leygues, creator of the new French Navy, has not done so much for his country to be now resting content on his oars and leaving pushful Italy in quiet enjoyment of speed supremacy. A tangible, uncontested margin of safety is what he is working for, and speed is foremost in the preoccupations of Admiralty experts and of private constructors who have been judiciously called to the rescue. To oppose the sixteen Italian units (12 *Vivaldis* and 4 *Condottieris*, capable of forming in 1930 a 38-knot squadron, a certain number of vessels combining superior speed and caliber and capable eventually of catching them up and bringing them to book is the task facing the Paris Admiralty and requiring immediate decisions. The plans of the six 2,500-ton super-destroyers recently ordered and of the six similar units of the 1928 program just voted are being revised with a view to greater speed. The motor-power is likely to be raised to 80,000 h.p. (instead of 64,000), raising the speed to an easy 37-knots under Service conditions, which would mean practical superiority over the new Italian ships. Speed requirements are more exacting in the French than in the Italian Navy. As to gun power, the new long-range 138-mil. gun is considered to be a match for 6-inch ordnance.

UNITED STATES

Greater Submarine Safety

Washington *Post*, February 20.—The tragedy of December 27, 1927, when the *S-4* collided with the Coast Guard cutter *Paulding* and became an underwater tomb from which forty men had no chance of escape, may never be repeated. Since the submarine was raised and reconditioned for experimental purposes notable progress in promoting safety underseas has been made. A short time ago men escaped from the submersible at a depth of sixty feet by means of an escape lock and mechanical lung device. The experimenters were not satisfied, and on Monday they sent the submarine 120 feet under water off Key West. Two members of the volunteer crew dressed in ordinary bathing suits and equipped with the mechanical lung emerged through the escape lock and rose to the surface in eight minutes. This is exactly the same depth at which the submarine lay when forty men perished fourteen months ago.

In spite of the great pressure of water on their bodies the men were uninjured, and the experiment was pronounced a complete success. There is little doubt that the Navy Department will now adopt the mechanical lung and escape lock as equipment for all American submarines.

The United States is not alone in developing safety devices for this purpose. Sweden has recently perfected a means whereby submersibles on the bottom of the ocean can signal surface vessels to their aid. Heretofore one of the most perplexing problems in rendering aid to a sunken submarine has been location of its position. There would be little value in any plan of escaping to the surface if there were no rescuing vessel at hand. The Swedish device is much like a water-bottle, located on the outside of the submarine and operated from the inside. In the daytime it will give off a dense smoke that will rise to the surface and remain in place for a long time. At night a brilliant fire signal can be sent to the surface.

With the perfection of this signal and the American system of escaping from disabled submarines, the hazard of underwater navigation should be greatly reduced.

Proposed Plans for New Cruisers and Carrier

New York *Times*, February 10.—Plans have been practically completed by the Navy Department for the construction of the first five cruisers of the fifteen authorized by the bill now before President Coolidge, as well as for the new airplane carrier. The cruisers will follow closely the design of the eight 10,000-ton vessels now being built, but the carrier will represent a wide departure from the *Lexington* and *Saratoga*.

While the details of the construction of the vessels are held as confidential, enough was revealed today to show that the new carrier will depart from the basic principles of the *Lexington* and *Saratoga* in that it will rely for defense on its own planes and the guns of other surface ships. The two big carriers are, in fact, fast cruisers, as well as carriers, with defensive armament.

Just when the new carrier will be laid down will depend on the time that Congress makes the first appropriation for it, but in Congress the belief is that the money may be provided in time to start construction next fall. The navy is prepared to call for estimates as soon as the appropriation is available.

The new carrier will be less than half the size of the *Lexington* and *Saratoga,* displacing 13,800 tons, as compared with their 33,000. One reason for the reduction in tonnage is that the operation of the big carriers is expensive. Another is that the navy desires four or five more carriers. The Washington naval treaty ratio permits the United States to have 135,000 tons in airplane carriers, 66,000 of which are comprised in the *Lexington* and *Saratoga.* With 69,000 tons left, it was decided that the building of four or five of 13,800 tons, or that approximate displacement, would be the best plan.

Furthermore, the conviction of the Navy Department, based upon experience, is that 13,800 ton carriers afford the best balance between the fast, seagoing qualities of planes and the larger number of carriers. Authorization for the construction of additional carriers is to be sought of Congress in the next year or two.

Unlike the *Lexington* and *Saratoga,* the new carrier will carry only antiaircraft guns and little protective plating. It will, however, carry about as many planes as the larger ships, the complement of which is seventy-two, with the possibility that that figure may be increased to nearly 100 by a rearrangement of facilities.

The new carrier will sacrifice speed, protective covering and guns in order to bear a large number of planes. The *Lexington* and *Saratoga* have the protective plating of cruisers over such vital parts as guns and machinery. They carry eight 8-inch rifles and twelve 5-inch antiaircraft guns. Their speed is approximately thirty-four knots. The speed of the new carrier will be around twenty-nine knots, and she will carry only a few antiaircraft guns.

In contrast to the design for the new carrier, the plans for the new cruisers show practically no change from the ships of that class now being built, the first of which will be completed late this year and the last by March, 1931. The new vessels will carry nine 8-inch and four 5-inch antiaircraft guns and be equipped with six torpedo tubes. Their speed will be between thirty-two and thirty-three knots.

These are features of the last six to be laid down of the eight cruisers now being built. The first two, the *Pensacola* and *Salt Lake City,* will carry ten 8-inch guns. The Navy decided, however, that under this arrangement, the ships were "over-gunned," in view of other elements of speed and protection, so that the last six of the group were designed to carry three turrets of three 8-inch guns, two of the turrets being forward and one aft.

This plan is to be followed for the first five laid down under the fifteen cruiser program. These vessels also are to be built for general service, whereas the last six of the earlier eight are being constructed as flagships, so that they may be used by rear admirals in command of cruiser divisions.

The fifteen cruisers, like the eight under construction, will each be equipped with two catapults amidships and will carry normally from four to six seaplanes, with the possibility that the number may be increased if experience is found to demand it.

Two planes will be carried on catapults and the others on decks ready for instant service.

The motive power designed for the cruisers is turbine engines driven by oil-burning boilers. Protective plating is placed about the machinery space and the guns. Those now under construction have a length over all of 585 feet 6 inches, an extreme breadth of 65 feet 2 inches and a normal draft of 19 feet 6½ inches. The first five to be built under the new program will have approximately the same dimensions.

Whether radical alterations will be made in the design of the next five will probably be determined in the light of the experience had with the first of the 10,000-ton craft to be placed in commission.

Under the bill the fifteen cruisers are

to be laid down in groups of five each year. Just how closely this program can be adhered to will depend upon whether Congress votes appropriations as fast as funds are required for construction.

Three of the first five are to be built in navy-yards, and as soon as an appropriation is available the Navy Department will call for estimates from the yards. The other two may also be built in navy yards, but the expectation is that they will be constructed by private shipyards, the contracts being let after open, competitive bidding.

MERCHANT MARINE

Sale of the Atlantic Lines

Washington *Post,* February 15.—The Senate commerce committee acted wisely in "consenting" to the sale of the Shipping Board Atlantic fleet to P. W. Chapman, Inc., of New York. The committee has had neither the time, experience nor background needed to make an exhaustive and impartial inquiry into the responsibility and capabilities of the companies and individuals making bids for the ships. The board, however, gave all the bids the most searching inquiry, and the fact that in its opinion the Chapman Company made a fair offer and is in a position to operate the ships over a period of years under the American flag, and in addition stands ready to add to the fleet the additional high-speed tonnage urgently needed, should be assurance enough that no mistake has been made in the sale.

Yesterday the Shipping Board accepted the Chapman bid. Under the terms agreed upon, the Government will receive $16,082,000 for the United States Lines and the American Merchant Lines, plus an additional sum of $218,000 for the leaseholds on offices and terminal facilities now maintained by the board. It will be stipulated in the contract of sale that operation over the routes now covered shall be maintained for a period of ten years and that the purchaser shall construct, with the aid of the Shipping Board's construction loan fund, two new fast vessels of at least 45,000 tons to round out the first-class service of the *Leviathan.*

The Government has taken an important step toward its retirement from the shipping business. There remain to be sold 254 ocean cargo vessels, for which a call for bids has been authorized, the sale of which would dispose of all the Government's laid-up fleet, with the exception of about 100 vessels retained for Shipping Board operations and forty lake cargo boats. The speedy and business-like disposal of the United States and American Merchant Lines should speed the sale of the ocean cargo vessels.

The Chapman Company bears the good will of the entire American people in the venture it has undertaken. In its hands lies the hope that the American merchant marine will be rebuilt until the American flag again flies proudly in every port of the world.

The Turbo-Electric Ward Liners

Marine Journal, February 1.—It is only natural in view of current events that much interest should attach to the recent placing of contracts with the Newport News Shipbuilding and Dry Dock Company for the construction of two 20-knot turbo-electric passenger ships for the New York and Cuba Mail Steamship Company.

The Ward Line's decision to use electric propulsion was guided by the performance of the new Panama Pacific liners, *California* and *Virginia,* owned by the International Mercantile Marine Company. Both of the new ships, therefore, will be equipped with General Electric turbo-electric drive. Comfort for the passengers because of the lack of vibration is one of the principal advantages of this form of propulsion.

The new liners were designed by Theodore E. Ferris, New York naval architect. Each will be a twin-screw vessel of 15,830 gross tons with an overall length of 508 feet, a beam of 69 feet 8 inches and a draught of 26 feet. There will be seven decks, four for passenger and crew space.

Each ship will have accommodations for 468 passengers, of which 378 will be first class. Regulations made by the London Conference for Safety of Life at Sea will be rigidly followed and special life saving and fire detecting and fighting devices will be installed.

There will be a total of 335,000 cubic feet of cargo storage space on each ship. Of this amount, 24,000 cubic feet will consist of cold storage space and 84,000 cubic feet will be for cooled air storage.

The new ships will replace the *Siboney* and *Orizaba,* which are now operating in

the Havana run. The superseded ships will be transferred to the Ward Line's New York-Mexico service.

In the power plant, steam will be generated in oil-fired, Babcock and Wilcox boilers, and will be fed to the turbines at 275 pounds gauge pressure and 200 deg. F. superheat. The turbine generators will be two General Electric machines each running at a speed of 3150 r.p.m. and rated 3,000 volts. The generators will be equipped with surface air coolers.

There will be two General Electric propulsion motors on each ship. These will be of the synchronous induction type, direct connected to the propeller shafts and having a normal rating of 6,250 horsepower at 134 r.p.m. each.

A dead-front control panel in the engine room will be equipped with the necessary high and low-voltage contactors for governing the propulsion circuits.

The majority of the ships' auxiliaries will be electrified, conforming with the owners' desire to make the new vessels electric ships in all respects. Direct current for operating these auxiliaries, and also for excitation and lighting, will be supplied on each ship by three or four auxiliary generators having a combined capacity of 1,500 kilowatts. The auxiliary circuits will be governed through a live-front auxiliary switchboard also located in the engine room.

The owners expect that the fuel consumption for all purposes, including propulsion, will be unusually low. The estimated figure is 0.8 pounds of oil per propeller shaft horsepower-hour.

Construction on the new vessels is scheduled to begin soon, and the builders have guaranteed to deliver the ships by November 1, 1930, in time for the fall-winter tourist runs to Havana.

Plight of Merchant Marine Naval Reserve

Marine Journal, February 15, by R. R. McNULTY, *Lieutenant, U.S.N.R.*—Admiral De Steiguer, U. S. Navy, at a recent banquet in New York said: "We are weak in all components that constitute sea power—we admire England's gigantic system—why not take a page out of her book?"

Though the good Admiral was training his guns on the cruiser situation it is worth the effort to apply his suggestion to our Merchant Marine Naval Reserve system.

Since July, 1928, 1,500 merchant officers have been enrolled in the American Merchant Marine Naval Reserve—that infant reserve born in 1925 but yet to be clothed with a congressional appropriation. England, whose naval ratio is presumed to be equal to ours, has an authorized complement of 2,200 R.N.R. merchant officers and 8,026 enlisted men. We have but *one* enlisted man. Our numerical strength from the standpoint of officers only is almost equal to that of England but our actual strength—officers trained on naval vessels and as capable aboard a man-o-war as on a merchantman—that's a different story—and just the place in this article where Admiral De Steiguer's statement could fit in.

To administer and maintain a most efficient Merchant Marine Reserve the English Admiralty spends about two million dollars a year, while our Navy Department annually begs for a sum varying from twenty-five to fifty thousand dollars only to be turned down by the "Budget" or by Congress. This appropriation is the most important page in England's Naval Reserve "Book."

Is it profitable to maintain an efficient Merchant Marine Naval Reserve? England's answer lies in a statement made by Lord Brassey more than a score of years before the Washington Disarmament Conference. Brassey said:

> Looking at the problem from the standpoint of the statement it should be the aim to strengthen our Navy, as far as possible, by means *which least tend to stimulate the regrettable rivalry in the maintenance of excessive armaments.* Constant and large additions to the permanent forces have that effect. *A force in reserve* does not in the same degree provoke retaliatory measures.

There are two points to note in Lord Brassey's statement: "rivalry in armaments" and "force in reserve." We do not have to stretch our imagination about the first point—it is a daily news item of the present day—but we are a bit foggy about "force in reserve." Did he mean trained men who could climb a turret or conning tower as readily as they walk the bridge or stand by the throttle of a merchantman? Further, did he have in mind an extreme such as the elimination of big navies by disarmament conferences and the consequent utilization of merchant vessels for naval campaigns? Only Brassey could answer the latter.

Let's go through the pages of the Royal Naval Reserve "book" and make notes for our American Merchant Marine Naval Reserve.

Note I. *Licensed Merchant Officers.*—The Royal Naval Reserve did not issue officers' commissions prior to the establishment of a Marine Department of the Board of Trade. This means not until the merchant officer was compelled to be certificated and his own standard boosted. It is interesting here to note a report of the English Parliament at the time when American clipper masters and mates were the world's standard. It reads, "The frequent incompetency of masters and officers appears to be admitted on all hands; this incompetency arises from want of skill and knowledge of seamanship and navigation; it being proved that officers have been appointed after only a short time at sea." Reports like this caused the establishment of a Marine Department of the Board of Trade in 1850. Since that date standards have been raised. To obtain the lowest British ticket at the present time the applicant spends two years on a schoolship such as the *Conway* or *Worcester* and then three years at sea as an apprentice. He is then ready for an examination almost as stiff as that for our American master.

Suffice it to say that in comparison it takes the American seaman only two years to get his license and if a native of one of three states out of forty-eight, he may have the opportunity of spending those two years on a schoolship, otherwise he walks from the for'le to the midship house.

Note II. *Administration.*—In charge of the Royal Naval Reserve is a full Admiral and to aid him in administration there exists a committee which includes a *shipowner.*

We have no such committee and but little contact with shipowners.

Note III. *Enrollment of Officers.*—In addition to deck and engineer officers the R.N.R. utilizes ship pursers and fishermen. Schoolship cadets are enrolled as probationary midshipmen and their career terminates with the attainment of captain and commodore. Midshipmen enter the service at the age of sixteen to eighteen years after two years study on an approved schoolship. Officers of the Merchant Service who have a first mate's license and are under twenty-four years of age are enrolled as probationary sub-lieutenants. In only rare cases are officers enrolled above the ratings just described.

The American Merchant Marine Naval Reserve does not utilize ship's pursers or fishermen for mine laying, and youngsters on schoolships are not enrolled until they reach the age of twenty-one and hold at least a third mate or third assistant's ticket. The American third mate and third assistant are enrolled as ensign; the second mate and second assistant as lieutenant (jg); the chief mate and first assistant as lieutenant; and the master and chief engineer as lieutenant-commander.

Note IV. *Training.*—All training service with the R.N.R. is "with full pay" in addition to the annual retainer fees. Training may be had in any part of the world with certain allowances for traveling expenses of officer.

Our Navy has had so much trouble obtaining appropriations from Congress to keep our regular Navy afloat, let alone a building program, it is hardly fair to criticise its two requests of $25,000 and $49,000, and ultimate failure to obtain one penny for the training of merchantmen.

Obligatory Training.—R. N. R. officers are first enrolled with a *probationary rating.* To make a permanent rating and thus be able to collect their retainer fees they must take the following obligatory training: (a) midshipmen—six months training upon completion of scholarship course; (b) acting sub-lieutenants—three months training which includes six weeks in a gunnery school; (c) sub-lientenants and lieutenants —same as acting sub-lieutenants but after confirmation they must take twenty-eight days biannually; (d) lieutenant-commander —twenty-eight days biannually for four years after promotion and subsequently twenty-eight days tri-annually; (e) commanders and captains—within six years of promotion must take twenty-one days gunnery, twenty-one days torpedo, seven days navigation and fourteen days signal submarine and and aircraft.

The United States Merchant Marine Reserve has at present no obligatory training.

Voluntary Training.—R. N. R. officers are eligible for the following voluntary training: (a) one year on H. M. ships for sub-lieutenants, lieutenants and lieutenant-commanders; (b) submarine course; (c)

signal course; (d) gunnery and such other courses necessary in naval warfare; (e) war college course—for a few commanders and captains.

Further service to join the fleet for maneuvers is permitted with the approval of the Admiralty.

Here is where England gets the merchant officer who is as efficient in a turret as on the bridge or in the engine room.

Note the War College course at Greenwich for commanders and captains. Picture an American Merchant skipper with books under arm trotting across the "campus" of our Naval War College at Newport. Let's hope we will see the day when a Yankee master can grab his diploma and land a Merchant attaché's job at the White House; a job similar to that of Captain Craddock, the British shipmaster who was aide-de-camp to the British ruler just prior to the World War.

The American Merchant Reserve officer may volunteer for training with the fleet for periods not to exceed fifteen days; this without traveling allowances or pay. At the rate of fifteen days voluntary training a year it will take some time for the American Reserve officer to stand up alongside the British and exchange conversation on the subject of submarines and anti-aircraft guns.

Note V. *Promotion.*—R. N. R. officers must complete all training periods in addition to maintaining an excellent merchant record before they become eligible for promotion.

Our Navy Regulations state that officers must pass a "professional" examination and be performing duties capable of promotion.

Will the American "professional" examination consist of military and naval subjects? If so, will fifteen days voluntary training do the trick or must the mate and engineer dig into meaningless words and illustrations? If the examination consists of subjects familiar to merchant routine, then there is something wrong about our Steamboat Inspection examination for raise in grade.

Note VI. *Discharge.*—R. N. R. officers may be discharged for the following reasons: (a) misconduct in Merchant Service; (b) failure to perform four consecutive years of training; (c) failure to be confirmed in rank; (d) if deck officers—non employment for four years in Merchant Marine; (e) breaches of naval discipline while in training.

The American officers may be discharged for breaches of naval discipline while under training and at the discretion of the Secretary of Navy. If not employed on merchant vessels for a period of three years he may be transferred to the Volunteer Naval Reserve.

There are numerous other notes which could be added but space will not permit. From the foregoing it is evident that England has a Merchant Marine Reserve which is most efficiently organized and trained.

To the Naval critic who says "England has been building up a Merchant Reserve for sixty years—give Americans that time and we will produce a reserve just as efficient;" Admiral De Steiguer has furnished the short cut formula.

"Just take a page out of England's book."

AVIATION

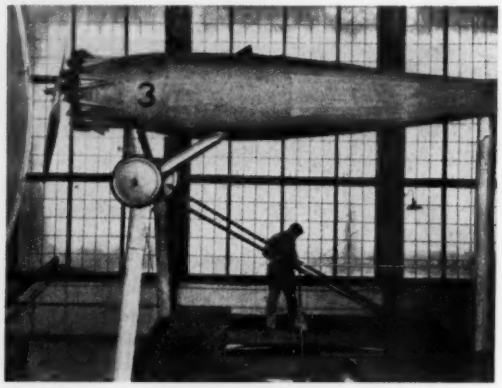
Recent N.A.C.A. Cowling Developments

Aviation, February 16.—Since the publication last November of the first tests with the N.A.C.A. low drag cowling for radial engines, there has been progress along various lines, and it is the purpose of this article to bring the developments as nearly as possible up to date. It is worth noting at the outset that most of the leading airplane manufacturers have cowlings of the N.A.C.A. type under construction, and that there is a tendency for some to make rather radical changes in the original form of the cowling to facilitate its application to their particular airplanes. It cannot be too greatly emphasized that it required careful design and development, with many changes and tests, to obtain proper cooling with this cowling on the "Whirlwind" J-5 engine in the 20-foot wind tunnel, and that while a satisfactory form has been worked out for the J-5 engine, both careful design and some development must be expected if the cowling is to be satisfactorily adapted to other engines. Also, any change in the outside shape which destroys the smooth nose will, judging by tests made in the 20-foot tunnel, nullify to a large extent the gain in performance with the complete cowling.

Wind Tunnel Tests

The cowling investigation in the 20-foot propeller research tunnel at Langley Field

has been completed. The report on the first portion of the tests involving a cabin fuselage was published last November. The re-



ONE OF THE N.A.C.A. COWLING TESTS IN WHICH FAIRING BEHIND THE INDIVIDUAL CYLINDERS WERE USED

port on the second portion has just been published, including tests on (1) an open cockpit fuselage with the new complete cowling, conventional cowlings, and various types of individual cylinder cowlings, and (2) engine nacelles both with conventional cowlings and with N.A.C.A. complete cowling.

Most of the forms of cowling tested on the cabin fuselage have also been tested on the open cockpit fuselage, and, in addition,

A CONVENTIONAL ENGINE NACELLE BEING TESTED IN THE 20 FT. PROPELLER RESEARCH TUNNEL AT LANGLEY FIELD

three forms have been tested on an engine nacelle, the "Whirlwind" J-5 engine being used in all cases. The results show that with conventional cowling, the smaller the cross-sectional area of the body behind the engine, the greater is the drag of the engine-body combination. One of the nacelle tests was made with the bare engine alone (i.e., without cowling or body). The drag of the engine alone was found to be 42 per cent greater than that of the cabin fuselage with the uncowled engine on the nose. The drag of the conventional nacelle was found to be 30 per cent greater than that of the cabin fuselage-engine combination with the same form of cowling.

With the new complete cowling, however, the drag of the nacelle is lower than that of the open cockpit fuselage, and the drag of the cabin fuselage is the highest. The gain with the complete cowling is, therefore, much greater for nacelles and small fuse-

THE ENGINE NACELLE WITH N.A.C.A. COWLING WHICH WAS USED IN THE COMPARATIVE TESTS

lages than for the large fuselages. In fact, the saving in drag by the use of the complete cowling instead of conventional cowling was found to be more than twice as great with the nacelle as with the cabin fuselage. The completely cowled nacelle had only about one-fourth the drag of the conventional nacelle, so that further improvement must necessarily be small compared with the gain already obtained.

The propulsive efficiency with a standard detachable blade aluminum alloy propeller was found to be about 2.5 per cent greater with the complete cowling than with any of the conventional cowlings, on the open cockpit fuselage.

Tests were also made with separate fairings behind the individual cylinders and with complete individual hoods over the cylinders, as shown in the accompanying illustrations.

The fairings behind the cylinders were found to have no appreciable effect on the drag. With the complete individual hoods only three cylinders were used for the drag tests because of insufficient room between the cylinders when all nine were in place. The cooling tests were made with the complete engine, but with a hood on the top cylinder only. This cylinder did not cool properly except with very large openings in the front and rear of the hood, and with the large openings the drag was greater than with the hoods removed. The individual hoods and fairings, therefore, do not show much promise for the type of cylinder used on the J-5 engine.

Agreement Between Flight and Wind Tunnel Tests

Many doubted the accuracy of the first flight tests with the new cowling, in which the maximum sea level speed of an Army AT-5A airplane ("Whirlwind" J-5 engine) was increased from 118 m.p.h with the original cowling to 137 m.p.h. with the N.A.C.A. cowling, an increase of 19 m.p.h. The full throttle revolutions were 1,900 in each case, so that the engine power was as nearly as possible the same. The increase of 19 m.p.h. seems, offhand, very remarkable, but the AT-5A airplane fuselage has a cross-sectional area of only 7 sq. ft., so that a large gain is natural as shown by the full scale wind tunnel tests, and there are also other factors which help to increase the speed. The propulsive efficiency with the complete cowling at 137 m.p.h. is more than 5 per cent higher than that with the original cowling and exposed engine at 118 m.p.h., as found from full scale tests in the 20-foot tunnel on the identical propeller used in the flight tests. About half of this increase in efficiency is due to the higher pitch setting of the propeller at the higher speed, and about half to the smoother body behind the propeller with the complete cowling. Also, a lower angle of attack is required at the higher speed so that the drag coefficient is less. The difference in drag is due almost entirely to the fact that the induced drag is less at the higher speed.

When these secondary factors are considered, calculations show that the reduction in drag indicated by the flight tests agrees exactly with that indicated by the wind tunnel tests for the same size body.

It is interesting to compute the power required if the speed of the original AT-5A airplane were increased from 118 m.p.h. to 137 m.p.h. by the use of a more powerful and, therefore, larger engine. In that case, the drag would be increased, not only because of the larger engine, but also because with the same size fuselage the ratio of fuselage to engine size would be smaller. Also, the larger engine would be heavier, resulting in a higher induced drag than with the original weight. Calculations of this nature have been based on the following assumptions:

1. The total increase in engine and structure weight due to increased size of engine is at the rate of 3 lb. per h.p.
2. The frontal area, and consequently the drag, of the engine vary as the square root of the power. (This is an approximate empirical value obtained from the Scarab, whirlwind J-5, Wasp, and Hornet engines.) (This is correct within 1 per cent.)
3. Propulsive efficiency is the same for both cases.

With these assumptions, calculations show that it would require approximately a 350 h.p. engine, similar to but, of course, larger

FRONT VIEW OF A BERLINER MONOPLANE EQUIPPED WITH N.A.C. A. LOW DRAG COWLING

than the J-5, to obtain the same high speed and cruising speed as was obtained with the 200 h.p. J-5 equipped with N.A.C.A. complete cowling.

The fuel consumption at the same high speed or cruising speed would, of course, be

A VIEW OF THE BERLINER MONOPLANE WITH ONE SECTION COWLING REMOVED SHOWING INTERIOR CONSTRUCTION. NOTE EXHAUST RING AND DEFLECTORS

about 75 per cent greater with an uncowled 350 h.p. engine than with a completely cowled 200 h.p. engine. The take-off and climb, however, would be better with the 350 h.p. uncowled engine, although the climb with the completely cowled 200 h.p. J-5 is somewhat better than with the same engine uncowled. The example of the AT-5A probably represents the maximum gain that is likely to be obtained with any type of airplane. It is a good example, also, for emphasizing the advantages of obtaining improved performance through better aërodynamic form rather than merely installing larger and more powerful engines.

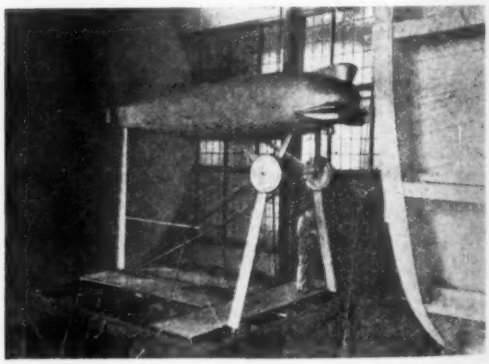
FURTHER N.A.C.A. FLIGHT TESTS

The National Advisory Committee for Aëronautics has undertaken the project for the Army and Navy of fitting two airplanes with the new complete cowling, and making complete performance tests with both the original and the new forms of cowling. The Army is furnishing a Fokker transport with three Whirlwind J-5 engines, and since the cowling for the J-5 has already been developed, no difficulty is anticipated with this airplane. The tests should bring out the high gain due to the complete cowling on the two nacelles. According to the wind tunnel tests, this gain should be so great that the airplane should attain its present maximum speed with the two wing engines alone, if the nacelles were equipped with complete cowling and the nose engine removed entirely.

The Navy has furnished a Curtiss pursuit plane with a 425 h.p. Wasp engine. The complete cowling for the Wasp engine may take considerable development before it is satisfactory.

NEW COWLING ON BERLINER MONOPLANE

The Berliner monoplane with a 110 h.p. Warner "Scarab" engine is, to the writer's knowledge, the first commercial airplane to be fitted with the N.A.C.A. complete cowling. This airplane was first flown about the middle of January and has been in the air a total of about two hours since, although no performance tests have been made at the time of writing. The cooling of the engine has been quite satisfactory in



ONE OF THE TESTS IN WHICH COMPLETE HOODS WERE USED TO ENCLOSE THE INDIVIDUAL CYLINDERS. THE SAME J-5 ENGINE AS USED WITH SIX CYLINDERS REMOVED

these flights, but no severe cooling test has been possible because of the cold weather.

The ideas regarding construction suggested in the first article on the N.A.C.A. cowling, which appeared in *Aviation*, November 4, has been carried out in the cowling on the Berliner monoplane, and the re-

sults are apparently very satisfactory. An exhaust ring is incorporated in the nose of the outer cowling as shown in one of the accompanying views. The outer portion of the nose cowling is made up of three quickly detachable sections which are mounted on the exhaust ring in front and on longitudinal braces along the sides. The two bottom longitudinals are formed by discharge exhaust stacks leading back from the ring. When the three sections of outer cowling are removed the engine is as accessible as with a small amount of conventional cowling.

The Paulin Adjustable Altimeter

Aviation, February 16.—By the use of the Paulin System aërial altimeter it is possible to determine the true altitude above sea level at any desired moment whether the plane be climbing or diving and with an error usually not exceeding ten feet. Another feature is the extremely sensitive "tendency pointer" which indicates at once any departure from a given altitude and makes it possible to fly at a predetermined level with ease and accuracy.

Instead of a constant reading pointer which tells the approximate altitude at all times, the Paulin altimeter has a manually operated "setting pointer" by which the exact altitude may be determined at any desired moment. This pointer is set by means of a large knob at the center of the dial. This knob is large enough to permit quick, accurate settings even when the fingers are protected by heavy gloves. The sensitive tendency pointer projects through a horizontal slot at the top of the dial. When the setting pointer has been set to the altitude of the instrument, the tendency pointer will be in the zero position at the center of the scale.

Wishing to know his altitude at any time the pilot glances up at the tendency pointer, moves the setting knob until the tendency pointer is at zero, glances at the setting pointer and reads the altitude which has just been determined. The setting pointer will remain exactly where set until again moved by the operator. If the pilot wishes to fly at any particular altitude he turns the setting knob until the setting pointer indicates the desired level on the altitude scale, and then either gains or loses altitude as may be necessary to bring the tendency pointer again to the zero position.

It is readily apparent that this indicating of a plane's position with regard to an altitude at which it is desired to fly, is an exact

THE PAULIN ALTIMETER

analogy with the direction indication of an earth inductor compass. A pilot may, by using the earth inductor compass and a Paulin System aërial altimeter, fly exactly in a predetermined direction and constantly at a predetermined altitude.

MISCELLANEOUS

The 1929 Maneuvers

New York *Times,* February 14, by Lewis R. Freeman, R.N.V.R., Special Correspondent with the Grand Fleet.—On board the U.S.S. *California,* January 31.—Real war and sham war have both their advantages and disadvantages. In real war—especially naval warfare—a combatant may go for a month, or a year, or the whole duration of the struggle, without engaging in real fighting. In sham war he will always get his "fighting" according to a schedule prepared long in advance, but it will never be real fighting.

Sham war—the war game—is an attempt to gain war training in peacetime by simulating as nearly as possible the conditions of war. Attaining an approximation of the real thing at a minimum cost of lives and material is the main thing in its favor. Against it is the fact that it will never be quite possible to parallel war conditions and

motivation when the life and death of men and nations do not hang in the balance. Subject to this limitation the war game is highly useful and the science of it—and therefore the tangible results from it—are improving year by year.

This is especially the case with the game of naval warfare. It is because there are more vital things to be given the near-acid test of near-war at the present time than ever before that the United States naval maneuvers of 1929 are by far the most important ever held by our own or any other country.

Problems of Defense Paramount

The problems laid down for study and attempted solution have always been defensive ones. If offense has ever been included it will always have been on the theory that there are conditions under which forthright attack is the surest defense. And even such theoretical defense, obviously—since tactical maneuvers cannot very well be held in the waters of even the likeliest of potential enemies—must needs have been worked on paper or the playbords of the War College.

The last lines of naval defense would, of course, be the Atlantic and Pacific coasts of the United States proper; but since those could never be menaced until certain outlying bases had fallen to the enemy, it is with the defense of these advanced points that present naval problems are most directly concerned.

There are two such points upon which naval attacks of enemy powers would inevitably be concentrated. One of these is Hawaii and the other the Panama Canal. The latter is by far the more vital of these. Hawaii could only figure in an attack by a Pacific power; Panama might be the objective of enemies on either the Atlantic or Pacific. Moreover, as the possession of Panama by an enemy—or even the destruction of one set of locks of the canal—would make it impossible to move the United States battle fleets from ocean to ocean, a successful blow struck there would be more severe than anywhere else.

Problems Formulated in Advance

The general character and plan of the problem are determined upon and laid down well in advance by the commander-in-chief of the United States Fleet and his staff. An outline of the problem is then sent to the respective commanders-in-chief of forces that are to oppose each other. Then, just as though a state of war was actually to exist at the time and under the conditions laid down by the problem, the commander-in-chief and staff of each force work out their plans on paper. These are submitted to the commander-in-chief of the fleet and, following his approval, war game hostilities are opened.

The following account of the development of events of a war game is written from the standpoint of the attacking force in the problem of 1929. Since many practices and inventions of a highly secret character are unavoidably revealed to the eyewitnesses of peace-time war, it is only to be expected that a censorship scarcely less severe than that of actual wartime operations must be exercised both during and after the events. Many of the dramatic and interesting occurrences may not and should not be described on account of the restrictions of censorship. This story, therefore, sets down only things that can be freely told. It should also be borne in mind that it is the somewhat partisan version of a camp-follower of one side—the attacking force. The fact that we were an enemy Pacific power moving against the United States and the Panama Canal detracted no whit from the vigor with which the attack was pressed, nor yet from the elation over every smashing success or the depression over every setback or failure.

The preliminary moves of the game began with our departure from San Pedro. We were told that the war had been in progress since the first of November, ten weeks previously, and that in this interval the Blue, or defending United States forces, had succeeded in laying mines off our base. Now we steamed to open sea through a narrow lane just cleared of mines by our sweepers.

This was on January 15. The problem was not scheduled to begin until the eighteenth. The three intervening days were spent in various exercises and maneuvers, especially by the planes of the battleships and the great aircraft carrier, *Saratoga*, recently commissioned and now figuring in the naval maneuvers for the first time. Her sister carrier, the *Lexington*, which was to help the Blue defend the canal, had been sent

south to join the scouting fleet some days previously.

The Plan of Campaign

In order that all officers and men of the Black fleet should have a full understanding of the more salient features of the work in hand, the following outline was printed and distributed to all hands on the night of the seventeenth:

THE WAR

We are Black.

Black, a Pacific power, and Brown, a European power, are allies; they declared war on Blue, the United States, last fall. In order to meet the threat of Brown the United States (Blue) concentrated her battle fleet in Hampton Roads.

The Black force, represented by the actual battle fleet, has orders to destroy the Panama Canal; Blue will endeavor to prevent this.

On January 18 the Black fleet (ourselves) was sighted by a merchant ship 2,300 miles from Panama and this information was conveyed to Blue. Blue immediately assumes that Black is headed for Panama. Blue is able to pass the scouting fleet through the Canal by January 22. Blue also orders her battle fleet to proceed from Hampton Roads to Panama. We do not know how fast this constructive fleet will steam, but it is possible for it to arrive as early as January 26.

On January 23 the game starts.

Blue has on the Pacific side at Panama the following:

Four battleships. Also army mine layers.
Five light cruisers. Army forts.
Lexington. Army aircraft.
Thirty-two destroyers. Army aircraft.
Some mine layers and other craft. Navy aircraft based on Coco Solo.

Black (ourselves) has:

Nine battleships.
Saratoga.
Thirty-six destroyers.
And some other craft, including a train of fifteen large ships.

The Black battleships are far superior to the four Blue battleships in the Pacific. The destroyers and aircraft are about equal. However, if the Blue battle fleet passes through the canal before our arrival there, then Black is faced with a far superior force. Naturally our (Black) efforts will be to destroy the canal, so that Blue battle fleet cannot pass through at all. If this can be accomplished we have only to face four enemy battleships already in the Pacific plus the *Lexington.*

Air Raid or Bombardment

Black has decided to (1) conduct an air raid against the canal locks; if this fails (2) bombard the locks with heavy guns.

On January 18 the Black fleet was divided into three forces:

(a) Striking force, consisting of *California,* Battleship Division Five, *Saratoga, Omaha,* and a squadron of destroyers. This force will approach Panama from the south, having made a detour, and will launch an air raid from the *Saratoga* against the Miraflores locks. En route, our job is to afford protection to the *Saratoga,* and to destroy the *Lexington* if encountered. This striking force can be counted on to whip the four older enemy battleships.

(b) The support, consisting of Battleship Division Four and the *Aroostook.* This force will approach the coast of Panama and will launch a plane attack against Gatun locks. This will be a long range flight and it will be necessary to sacrifice the planes. They will not attempt to return but will intern in neutral territory.

(c) The train will be guarded by Battleship Division Three and the submarines. It has orders to approach Panama by a wide detour, keeping away from range of shore based aircraft and attempting to evade Blue forces.

The two air raids will take place at daylight next Saturday, January 26. On that date we will enter the Bay of Panama before daylight and send up the planes from the *Saratoga.* At the same time the four battleships of the striking force will engage at long range any Blue battleships which are met, and engage any planes attacking the *Saratoga.* If our battleships come within range of the army forts, the destroyers have orders to lay a smoke screen between the ships and the observation posts in order to prevent the army from spotting. As we will be operating in shallow water paravanes will be used to counter the mine threat. On conclusion of the air raid and after planes have returned to the *Saratoga,* the striking force will concentrate with the support (Battleship Division Four) about 90 miles to the southward at six o'clock in the evening and will operate to prevent escape of Blue battleships.

If information is received that the Blue battle fleet is coming through the canal during the night of January 26-27, it is the intention to conduct a night bombardment of the entrance to the canal. For this bombardment Battleship Division Five and the *California* will enter the range of 16-inch and 14-inch guns of the forts and lay down a barrage at the entrance of the canal, using indirect fire and aircraft spotting. The destroyers will illuminate navigational markings and will put down smoke screens between the forts and the ships. As a safety measure, airplanes will not actually be catapulted during the night.

On the morning of January 27, assuming that the air raid was unsuccessful, Battleship Division Five and the *California* will conduct a gun bombardment of the Miraflores locks. To do this it will be necessary to come within the range of 14-inch and 16-inch army guns. We will steam up to a position off Panama and begin the bombardment, using indirect fire and aircraft spotting. The airplanes will be catapulted for spotting. One division of destroyers will screen us with smoke. Meanwhile Battleship Division Four will hold off the Blue battleships. Destroyers and the *Saratoga* planes will be used to lay smoke screens to protect us from army spotting.

Submarines Restricted

The information contained in this outline respecting the enemy's strength and disposi-

tion of forces was all we had. His knowledge of us we assumed to have been equally brief and sketchy. Of the waters of Panama Gulf and Panama Bay and of the topography and defenses of the Canal Zone we knew a great deal more than an enemy could ordinarily be expected to know. We were permitted, however, to take advantage of this in every way possible.

A ruling as to the employment of submarines left us somewhat in the dark. We were accompanied by the regular flotilla of cruising underwater craft attached to the battle fleet, together with their tenders. In ruling that, to minimize risk of disaster inseparable from operation of units under more than one control in the same waters, these should not submerge within 450 miles of Panama, the Black fleet was virtually deprived of submarines for either scouting or attack. Whether or not Blue submarines had been similarly ruled out we did not learn until later—to our sorrow.

The practice value of cruising with the battle fleet was taken advantage of in every way possible by the submarines in the course of the voyage south. One of the experiments was that of long-distance towing, a unit of the "V's" doing the whole distance from San Pedro to Panama at the end of a hawser. All the time they were in sight of the battle fleet the fantastic silhouettes of the submarines—now notching this skyline, now that—shifted in exercise after exercise. These doubtless continued as they went on the even tenor of their way after the fighting units of the fleet had broken up into the several forces as planned and dispersed for the attack.

NEWS FROM SPIES

During the five days from January 18 to 25 the Black fleet was mainly engaged in making southing and easting toward the field of battle without giving the enemy any unnecessary clue as to what route it was taking. This was effected principally by following a course well off the regular steamer lanes, reducing smoke to a minimum and using the radio as little as possible. It was quite within the rules to use spies subject to about the same limitations under which such agents would have to work in time of real war. Blue, for instance, was quite entitled to have spies on coastwise steamers or at ports in Mexico or Central America where information might conceivably be obtainable of our movements from coastal ships. Black, on the other hand, was entitled to have spies in Panama observing transit of Blue ships through the canal and their movements later. As a matter of fact, information sent us in secret code by such a spy was of considerable service at one stage.

It was not permitted, of course, for either Blue or Black to have spies among the personnel of the opposing force. A rather remarkable case in this connection arose when the navigating officer of a Black ship was transferred, by orders from Washington, to an important unit of the Blue force just before Black's sailing from San Pedro. The Navy Department had simply gone on grinding out its grist in the usual way and the possible complications of such a transfer at so critical a time had not been considered.

With the transferred officer in complete possession of Black's plans as already outlined it would, of course, have been possible for him to have passed this on to the Blue staff and so permitted dispositions that would have completely demoralized Black's attack. As he was already on a Blue aircraft carrier heading south to aid in the defense before the slip and its possible consequences were discovered by Black, it was not possible to request Washington to defer the transfer until after the problem was completed.

It is earnest of the high sense of honor and sportsmanship that it is taken as a matter of course would actuate a United States naval officer under such circumstances, that a radio from Black reminding the transferred officer merely that he was expected to forget all he had previously learned of Black's plans and dispositions was deemed sufficient to dispose of the possibilities of embarrassment as consequence of the official slip.

CLOSING IN

By every trick fair under the rules of the game, the Black fleet endeavored to gain knowledge of the movements and disposition of the defending enemy. By keeping far to the west of the coastal steamer lane the danger of being reported by spies and neutral observers was minimized, while a radio silence as deep and unsoundable as the Pacific itself it was aimed to keep Blue

from locating us by directional wireless until much time as actual operations forced us to become more vocal—and by that time it was too much to hope that his scouts would not have established visual contact and fastened upon us for good so far as secrecy of movement was concerned.

With initiative as to time and points of striking resting with the stronger attacking force as represented by the United States Battle Fleet under Admiral Pratt, the task of the Blue defenders of Panama was a difficult one, especially under the limitations of the problem which did not permit them time to lay mine fields, which in actual war would be the one surest and most impenetrable barrier against an enemy operating to destroy the canal. With thousands of square miles to scout with only five light cruisers and thirty-two destroyers, Blue had to keep his light craft constantly on the move at high speed, and the disposing and controlling of such a force acting in this way meant that the ethers must be ceaselessly "sown with the stealthy ghosts" of wireless. So far as was possible, of course, he employed frequencies calculated to give a minimum clue as to position of sender; but just as a man shouting in even the densest darkness ultimately reveals his whereabouts, so Blue's hundreds of signals flashing through the air ultimately disclosed much that he would have kept from the relentlessly closing battleship lines of Black. As the zone of probable contact was neared Black kept gathering more and more of the disposition of the defending forces. Blue, doubtless, was collecting certain valuable information on his own account, but from the nature of the respective rôles of the two fleets, it was almost inevitable that Black must fare the better on this score.

On January 23, eight days' steaming southeast from San Pedro, the war game began in earnest. Although there was still a day or two to go until, under the limitations of the problem, actual contact could be made with even the furthest flung of the enemy scouts, the first of the final dispositions of the forces of the Black battle fleet were now made. That called the support, consisting of the Fourth Battleship Division and the airplane carrier, *Aroostook*, stood away on the most easterly course. The *Aroostook*, though only a tender, represented the old carrier, *Langley*, temporarily away on refit. Theoretically, she carried all of the *Langley's* twenty-five planes, though the latter were really parked on the broad decks of the *Saratoga*, bringing that great carrier's total up to over 100.

One Bomber a Squadron

The *Aroostook* actually carried only a big two-motored Sikorsky bomber. On the morning the *Saratoga* was to make its great attack on the Miraflores Locks on the Pacific side of the canal, the *Sikorsky*, simulating a whole squadron of bombers, was to be launched in the quiet water of some cove on the north coast of Panama and start an overland flight to drop its eggs on the Gatun locks and spillway on the Atlantic side. The successful bombing of these objectives would not only put the canal out of commission and so hold the great reinforcing Blue Battle Fleet racing south from Hampton Roads in the Atlantic, but might also sweep Cristobal and Colon into the sea before the besom of the floods pouring down the Chagres from Gatun Lake. It was war à la outrance that the modest little *Aroostook* was going to launch upon the enemy—if she lived up to all she pretended to be, that is, and did all she and her *Sikorsky* were expected to do.

That part of the Black force called the train consisted of a number of supply ships and tankers. Protected by Battleship Division Three and our submarines, it was ordered to follow the even tenor of its way by a wide detour that would be charted to minimize its chances of falling in with the scouting craft of the enemy or his shore-based aircraft.

Blue had enough strength in battleships and light cruisers to have inflicted severe punishment upon either "the support" or "the train," could it concentrate and fall upon one or the other separately. It is doubtless because this chance was taken that Black's plan has since been repeatedly characterized as bold and audacious. It had elements of both; but it was Admiral Pratt's confidence that Blue would concentrate on finding and destroying the *Saratoga* and so rid themselves of the great potential threat of that carrier's hundred planes that must have induced him to take the risk for the sake of driving home his back-door attack on the canal with the *Sikorsky* and its mythical squadron of bombers.

Black's powerful striking force, consisting of the flagship *California,* the great 14- and 16-inch gunned battleships of the Fifth Division, the *Saratoga,* the light cruiser *Omaha* and eighteen destroyers, had nothing to fear from any battleship concentration of the enemy. The only menace was that of bombs from the air and torpedoes that might be launched by submarines, destroyers or planes. Our own screening destroyers made the torpedo menace of small though by no means negligible moment. Against a surprise bombing attack—as from squadrons from the *Lexington* or the land stations—there was no defense but the anti-aircraft guns of the various units. These could inflict damage on attacking planes but could not be expected to drive off a determined attack in force until every ship bombed had been badly punished. The battleships, with their armored sides and decks, could still be expected to carry on more or less effectively after such a bombing, but a few thousand pounds of high explosive dropped upon the deck of the *Saratoga,* though probably still leaving her afloat, would make the launching of any undestroyed planes quite impossible.

"Saratoga" Plays Safe

The first care of the striking force, then, was to take every precaution to see that the *Saratoga* was preserved intact until the last of her planes was launched in the great raid against the Miraflores and Pedro Miguel locks. If she was destroyed after that the price was a trifling one to pay for the blocking of the canal and the holding of the enemy battle fleet in the Atlantic, thus allowing Black to operate in the Pacific almost at will.

Consequently, the Black staff deemed the safest course would be to send our great carrier so far to the south and west that the probabilities of its being located by the Blue scouting craft in time to plan an effective air attack against it would be almost negligible. Accordingly, the *Saratoga,* accompanied only by the *Omaha* and two destroyers, was detached and sent off into the Blue. From then on to the end of the problem staff officers with squinting eyes and furrowed brows lamented our lack of cruisers and told of the things Black could have done had we had them, or could not do for want of them. Of the handicap under which the whole United States Navy of the present day labors through lack of light cruisers there is no possible doubt.

For the puissant striking force, serene in its own strength, it was now simply a matter of avoiding contact with enemy scouts for just as long a time as possible and then, in the face of all mischances of war and weather, turning up at a certain rendezvous before daylight on the morning of the twenty-fifth, to protect the *Saratoga* while she was carrying on the all-important operation of launching her raiding planes. That sounded simple enough for the one force that was complete cock of the sea lanes, but that unforeseeable conditions could arise to make such a consummation all but impossible the sequel will show.

Blue Gets Through Canal

For another twenty-four hours life on the *California* went on with little to break the ordinary routine of cruising. Messages from our spies or deductions from carelessly framed signals told that the Blue battleships had transited the canal as laid down in the problem. A little later we knew that they had steamed out into the Pacific and that there was great activity at enemy air stations and submarine bases. One belated light cruiser, hastening to catch up with the Blue procession, told our crafty code experts a good deal more than she had intended to include in the signal. Time and again I heard a signal worded and reworded on the bridge of the flagship to play as safely as possible against a similar slip on our own part. Since the enemy was sending perhaps a score of signals to our one, it followed that his chances of leakages as against ours were in about the same ratio.

The ships of the squadron were darkened as I climbed the half dozen flights of ladders to the bridge, but in the brillant light of a moon which lacked but a day or two of being full it was possible to see not only the gigantically looming shapes of the battleships as they steamed along in loose cruising formation, but even the ghostily gliding shapes of the most distantly flung of our screening destroyers.

There was some talk on the bridge about fuel consumption, due to the fact that the constant maneuvering of the distroyers at fast speed had been responsible for unexpectedly rapid depletion of oil supply. One

called the *Shirk*—due, it was surmised, to a foul bottom—was especially low in fuel, and it was thought probable she would have to be sent back to the train to re-oil from the tanker. There was just a bit of tendency, it seemed to me, to be annoyed at the *Shirk* for being low in fuel. Not that pushing a weedy bottom around the Pacific at from fifteen to twenty-five knots was not a perfectly valid excuse for emptied bunkers, but only that any kind of lame-duckery has considerable potentialities for evil in the way of throwing a monkey-wrench into the well-oiled machinery of a naval plan.

Presently the *Shirk* was bundled off to nose through a hundred miles or so of darkness after a drink of oil. She rendezvoused with the tanker and sucked her bunkers full as ordered, but shortly afterward things transpired which threw her very much on her own resources. This was the flinging of a closely meshed section of the Blue scouting net right athwart the very neck of the Pacific across which she had been told to return to her squadron.

And so the *Shirk,* as happens to all adventurous destroyers sooner or later in real war, was forced to act upon her own initiative. Hounded all night by enemy destroyers and light cruisers, which gave her attention out of all proportion to her size, through suspecting that she was leading the *Saratoga* in for an attack upon the *Lexington,* she still managed by skillful ducking and dodging from being brought closely enough into action to allow the most partisan of umpires to declare her sunk, or even hit and diminished in speed. By devious wet seaways she worked nearer and nearer to the one most important rendezvous of the problem—that to which the *Saratoga* was to come charging up from her lurking place south of the equator to launch her bombing planes against the canal.

The "Shirk" on the Job

Gray dawn had flamed to golden dawn and golden dawn to red before the harassed maverick had slipped through the enemy's net and shaken off the last of the hue and cry. She was late—very late—but she was doing her darndest. A big yellow sun with a genial grin on his face eased up over the rim of the Gulf of Panama and watched a hurrying destroyer splitting the surface of the Pacific into two more or less equal parts as she rushed to keep an urgent appointment. In her teeth was a bone that would have been a creditable mouthful for a battleship; astern of her was a geyser of wake that boiled as high as her bridge.

The level rays of the rising sun, stopping to paint a few rainbows in the spray above the bows of the speeding destroyer, fell at last upon a futuristic nightmare of a silhouette against the southern skyline, which had to be either the *Saratoga* or the *Lexington.* When certain esoteric symbols revealed it as the *Saratoga* the *Shirk* popped off a recognition signal and asked in the quaint language of the sea if she could be of service.

Never was a coming more opportune. The *Saratoga's* tired bombers and fighters, winging back after their raid of raids, were just beginning to drop out of the sky and maneuver for deck landings. With the quiet haven of its home roost beckoning welcome from below, something went wrong with one of the returning pigeons. It may be a spark plug had become fouled, or that the two hundred or three hundred mile round trip, with an aërial fracas thrown in going or coming for good measure, had licked up the last of its gas. At any rate, Mother *Saratoga* had seen her baby crash into the sea, and was highly concerned.

Just what was engaging the *Omaha* and the *Saratoga's* two destroyers is not clear at the moment of writing. They had all been engaged in the course of a hectic night, and it may be that one or all of them was theoretically disabled. Or it may be that they were off putting up their backs and spitting at the pestiferous enemy scouts at the moment. In any event, there was a crashed plane and a pilot floating in the sea until the *Shirk,* with a rainbow around her shoulder and a wake like a railroad embankment, came dancing up along the path of the rising sun and did as directed by a blinking light on the crazily perched platform called the bridge of an aircraft carrier. A few minutes later "Ma" *Saratoga* was clucking contentedly over her salvaged chicken and saying nice things to the knight errant that had galloped up and made the rescue in the nick of time.

Of all the battleships and destroyers of the "striking force," only the foul-bottomed *Shirk* had been able to make the rendezvous with the *Saratoga.* How circumstances be-

yond all human control had made it impossible for the battleships to arrive as planned, and how the forthright resourcefulness and audacity of Admiral Reeves had effected the launching of the planes for the *Saratoga's* epic raid on the canal locks I shall tell in a later article.

Some time later a signal was sent from the flagship to a dull blur of white-fringed gray that the glasses showed to be a destroyer on the outer line of the screen protecting the "striking force" from torpedo attack as the battleships steamed in to engage the land guns of Panama and attempt to mingle a few fourteen- and sixteen-inch shells with the bombs planted by the *Saratoga's* squadrons on the Miraflores locks. I did not learn the exact wording of it, but the gist was "Well done, *Shirk*."

What's in a name, after all?

Navies Not Obsolete

Washington *Post*, February 11.—Lieutenant Commander J. M. Kenworthy, M.P., and George Young, Englishmen, have published a book entitled *Freedom of the Seas*. In it they discuss naval warfare and types of ships, and come to the conclusion that navies have already been rendered obsolete by aircraft. The cruiser, they say, is a tactical weapon that is fast losing, or has lost, its military importance; and the battleship, in their opinion, has become only a costly white elephant. The next war, they conclude, will be won by air bombardment and blockade, with sea power and surface ships counting scarcely at all.

There is a good deal of talk going around regarding the value of this ship or that weapon in the "next war." Some of it is the result of misinformation; some of it is based on fact. In attempting to forecast the future, it is not difficult to see that which one wishes to see. Navies can only hope to keep pace with the present, attempting as best they can to make provision for the future.

The only actual test of naval weapons lies in their performance in maneuvers. The United States Navy, operating off Panama, is at the present moment engaged in such a test. Although the maneuvers are not yet completed, Admiral Wiley made a statement to the press the other day that is of interest in this connection. The statement is not official, nor does it pretend to give a summary of the knowledge gained during the war game. The maneuvers have brought out, in Admiral Wiley's opinion, the following valuable points:

1. They have accentuated the fact that cruisers that can keep the sea and make speed under all weather conditions are vitally necessary to the successful conduct of any naval campaign.

2. They have proved that the necessity of various types of surface and subsurface craft has not been lessened and that the battleship remains the backbone of the fleet.

3. They have proved that aviation has introduced an element into military and naval operations whose value can not be ignored.

4. They have proved that aviation has added a very valuable component to the fleet and that its development in the United States fleet is progressing satisfactorily.

In other words, despite Commander Kenworthy's assertion, naval safety is based upon well-rounded development of all types of craft and weapons. There may be a day when naval vessels will be as obsolete as the pikestaff, but that day has not yet arrived.

Future Naval Construction

The Engineer, January 25.—At first glance the question of future warship design may not appear to be one of immediate importance. As our readers are aware, capital ship construction has been suspended by the Washington Treaty, and cannot, in any event, be resumed before 1931, while the same instrument, by imposing limits on tonnage and armament, has virtually standardized cruiser design the world over. There is, nevertheless, a certain urgency in this question, for, unless we are greatly mistaken, the naval constructors of Great Britain, the United States, and Japan are already at work on tentative plans for the ships which may have to be laid down two years hence. So far as the United States is concerned, authoritative evidence on this point can be quoted. In its statement of policy issued on November 13 last the Navy Department announced its intention, *inter alia*, "to prepare and maintain detailed plans for new capital ship construction," and "to replace existing capital ships in the years specified in accordance with Treaty provision." As regards our own policy, the First Lord of the Admiralty, when submitting the

current Navy Estimates to Parliament on March 15 last, alluded to "the possibility of having to replace battleships at the expiration of the time of the Washington Convention." That this possibility is regarded by the Admiralty as a probability may be inferred from the remarks made by Vice-Admiral Sir A. Chatfield—then Third Sea Lord—at the launch of the *Rodney* at Birkenhead on December 17, 1925. "It is not the sailors' view," he said, "that this is probably the last battleship that will be built. Rather do we look upon her as the first of a great new line, and we hope that many other *Rodneys* and *Nelsons* will be built in the future." Numerous messages from Tokyo indicate the resolve of the Japanese naval authorities to build new capital ships under the Treaty replacement rules. Again, there are unofficial advices from Paris to the effect that France, in view of the accelerated obsolescence of her heavy ships, and still more in consequence of the advent of Germany's remarkable armored ships of the *Ersatz Preussen* class, is reconsidering her decision to build no more capital units and will, sooner or later, construct "small battle-cruisers" of 17,500 tons. Clearly, therefore, the pause in heavy construction is not likely to be permanent.

There are two ways of looking at the Washington Treaty so far as it affects capital ship design. The taxpayer may regard it as an unqualified blessing, in that it has checked what threatened to develop into a ruinous competition in tons and guns between our own country, the United States, and Japan. It is undoubtedly the fact that, on the eve of the Washington Conference all three Powers contemplated the building of ships that would have cost from eight to nine millions each. To the enthusiastic naval designer, however, the Treaty is less attractive. Writing in *Brassey's Annual* for 1923, Sir George Thurston described it as "an artificial restriction on the progress of scientific achievement." He went on to point out that if the research work of recent years in gunnery, propelling machinery, and protection were to be utilized to the fullest extent, it would be essential to raise capital ship displacement to something like 57,000 tons, or 22,000 tons above the Treaty limit. In that case, we think, a great many people in this country will deem it fortunate that diplomacy intervened in the nick of time. Long-suffering and patriotic though the British people is, we fear it would have jibbed at the prospect of rebuilding the Fleet on the basis of £9,000,000 ships. Nor are we satisfied that such enormous dimensions are indispensable to tactical and strategical efficiency. Few naval officers of our acquaintance dissent from the view that in pre-war days the cult of bigness was carried too far. The outstanding lesson of Jutland with regard to material was that mere size is no talisman of victory. Given a common standard of marksmanship, the gun of medium caliber—"medium" in this sense signifying 11-inch to 13.5-inch—has proved itself to be at least equal, if not superior, to the heavier but slower-firing gun. Thanks to its superior ballistic qualities the latter would doubtless score at very long ranges, but in the light of experience gained in action during the war, and in post-war full-caliber "shoots," does anyone seriously contend that future naval engagements will be decided by gunfire at any range above 20,000 yards? Our own impression, founded on data gleaned at first hand, is that naval artillery duels fought at any range exceeding 20,000 yards will be indecisive and merely result in a waste of ammunition. Advanced methods of fire control, aircraft spotting, increased muzzle velocities, and improved projectiles, all these have contributed to make gunfire more accurate—up to a point. Even so, visibility remains the imponderable yet dominant factor, and, in the western hemisphere at least, it will always exist as the principal obstacle to accurate shooting beyond the distance we have mentioned. Now at 20,000 yards the ballistic qualities of the 13.5-inch or even the 12-inch gun, do not suffer greatly by comparison with those of the 15-inch or 16-inch, and the former weapons have the advantage of superior rapidity of fire. We are often invited to consider the tremendous effect of a well-aimed salvo from the 16-inch guns of the *Nelson*, each of the projectiles weighing roughly a ton. Without doubt, a direct hit by even one of these levin-bolts would prove very destructive, but would it do more damage than the impact of two 13.5-inch or three 12-inch shells? War experience suggests a negative answer. If that be so, a strong case could be presented for the smaller gun, which could probably fire twice as rapidly as the 16-inch. In other words,

a vessel training ten 12-inch guns on the broadside would be able, within a given period, to deliver a volume of fire but little inferior in weight to that of a vessel with nine 16-inch guns, and, other things being equal, the more numerous guns would register more hits. It may be, of course, that the vitals of the *Nelson* are proof against 12-inch projectiles fired at long range, though we are not prepared to endorse that assumption off-hand. While our future policy of construction must necessarily be determined in some degree by that of other Powers, we see no cogent reason why, if other Powers elect to go to the limit in displacement and caliber, this country should follow tamely in their wake. There is good evidence that the American replacement ships planned for 1931 will be designed up to the Treaty maximum of 35,000 tons and mount ten 16-inch guns. The appearance of such mastodons would doubtless provide a strong, if superficial, argument for the building of similar ships for the British Navy. We hope, however, that our naval directors will take a broader view, and not allow themselves to be drawn into a tonnage and gun-power competition which bears no actual relation to British requirements. They have already shown praiseworthy enterprise in breaking away from the standard Washington type of 10,000-ton cruiser and producing, in the *York* class, a type of cruising ship which, while being smaller and cheaper, is admirably adapted to the special needs of British strategy. In capital ship construction our policy should be guided, not by what America—whose naval problems differ fundamentally from our own—chooses to do, but by the requirements and contingencies of the future. Is there, for example, no lesson for us in the new orientation of naval design on the Continent? Let us assume, for the purpose of argument, that the German *Ersatz Preussen* type finds favor with other naval Powers and is widely reproduced. Confronted with the task of dealing with such vessels, our present battle fleet would be almost impotent, nor would the addition of a dozen *Nelsons* or *County* cruisers help to solve the problem. If a ship of the *Ersatz Preussen* class were harrying British trade it is difficult to see how, with our present resources, she could be brought to book. Her speed of 26 knots, and her cruising endurance of 10,000 miles at 20 knots, would enable her to elude battleship pursuit, while with her armament of six 11-inch guns she could easily overwhelm any cruiser that ventured within range. She would, in fact, be immune from any type of ship other than the battle-cruiser, and of such ships we have but four. The projected French vessels of 17,500 tons, eight 12-inch guns, and 33 knots speed, would raise the same problem in an aggravated form.

So many developments in foreign naval design are either foreshadowed or actually in progress that it would surely be a grave error on our part to concentrate on the planning of improved *Nelsons*. The real question, it seems to us, is not whether we ought to lay down more *Nelsons* in 1931, but whether we can afford to be bound much longer by a Treaty which inhibits us from building anything between a 35,000-ton, 16-inch gun battleship and a 10,000-ton, 8-inch gun cruiser. When France and Italy signed the Treaty each expressly reserved the right of employing the capital ship tonnage allotted to her as she might consider advisable —that is, the right of building ships of any displacement from 10,000 tons up to 35,000, and arming them with any gun from 8-inch up to 16-inch. This reservation gives each of the two Powers a liberty of action which might be invaluable in certain circumstances. We see no reason why Great Britain should not be granted the like freedom, and so enabled to deal with the new problems of defense as they arise. Since the United States is chiefly interested in naval equality on the basis of aggregate tonnage, she could not consistently raise an objection to such a proposal. The point we would stress is that the future naval requirements of the Empire cannot be met by 35,000-ton capital ships and 10,000-ton cruisers alone. The evolution of intermediate types is only a question of time, and we must be free to amend our building policy in accordance with changing conditions of strategy.

NOTES ON INTERNATIONAL AFFAIRS

FROM FEBRUARY 4 TO MARCH 3

PREPARED BY PROFESSOR ALLAN WESTCOTT, U. S. NAVAL ACADEMY

UNITED STATES AND EUROPE

CONFERENCE ON WORLD COURT.—Prior to his departure for Europe as delegate to the conference of jurists at Geneva for consideration of changes in the League statute creating the Permanent Court of International Justice, Mr. Elihu Root made a brief visit to Washington, during which he conferred with President Coolidge and with members of the Senate Committee on Foreign Affairs. To the influence of this visit was generally attributed the note subsequently sent by Secretary Kellogg on February 19 to all the member nations of the Court. This note invited the powers to a renewed effort to overcome their objections to the Fifth Reservation made by the United States in her offer to join the Court. It will be recalled that this reservation, restricting advisory opinions from the Court to the League Council in matters where the United States "has or claims an interest," has been the only stumbling block preventing acceptance of the American proposals. Secretary Kellogg's note, after discussing the point, remarked that agreement appeared possible, since there seemed to be "but little difference" of opinion regarding the substance of the rights and interests involved.

Mr. Root arrived at Geneva on March 1, just before the meeting there of the League Council. It was reported that several of the jurists in attendance at the conference, set to meet on March 11, would advocate abandonment altogether of the Council's past policy of calling on the Court for advisory opinions. Such a course would at once remove the obstacles to American entry. The Court has already refused, in the Carelia dispute between Russia and Finland, to give an advisory opinion to the Council when one nation involved was not an adherent of the Court.

ANTI-WAR TREATY RATIFICATIONS.—On March 2, just at the close of the Coolidge administration, eleven of the sixteen original signatories of the Kellogg-Briand Anti-War Treaty deposited their ratifications at the State Department in Washington. At that time the ratifications necessary to put the Treaty into effect were lacking from only four countries: Poland, whose ratification papers were on the way by special messenger; France, where the treaty had been approved by the Chamber but was awaiting action by the Senate; Japan, which had difficulty over the phrasing of the treaty which makes renunciation "by the peoples" and not by the Emperor; and Belgium, from whom ratification was expected within two or three days.

CRUISER BILL PASSED.—The Cruiser Bill, providing for the construction of fifteen light cruisers, five to be begun in each of the three years ending June 30, 1929, 1930, and 1931, and one aircraft carrier to be undertaken before June 30, 1930, passed the Senate on February 5 by a vote of 68 to 12 and was signed by the President on February 13. The bill contained Senator Borah's amendment on freedom of the seas, which as modified by Senator Reed finally read as follows: "First, that the Congress favors a treaty or treaties with all the principal maritime nations regulating the con-

duct of belligerents and neutrals in war at sea, including the inviolability of private property thereon. Second, that such treaties be negotiated, if practically possible, prior to the meeting of the Conference for Limitation of Armaments in 1931."

ARMS EXPORT PROPOSALS.—Following the ratification of the Kellogg Peace Treaty and the approval of the Cruiser Bill, great interest was shown, both in the United States and abroad, in the revival of Senator Capper's proposal to give the President power to prohibit export of munitions to any country violating the Kellogg Treaty. Senator Capper's resolution was referred to the Foreign Affairs Committee, and will not come up before the regular session next December, if at all. Chairman Porter of the House Foreign Affairs Committee proposed a somewhat similar resolution in the House, which would give the President authority to stop shipment of munitions to "any country where conditions of domestic violence or of international violence are threatened." These proposals were welcomed abroad in the belief that they would put the United States in line with the League of Nations by providing for positive action against an offending nation. Speaking of the Capper Resolution, President Coolidge thought it "went too far." Though no doubt a president's discretion could be trusted, it is evident that restrictions such as proposed might easily involve the United States in what would amount to practically hostile action in a conflict where this country was not directly concerned.

NEW BRITISH PROPOSALS RUMORED.—Much curiosity was excited by a statement of the British Ambassador, Sir Esme Howard on February 15 that the passing of the Cruiser Bill cleared the ground so that new proposals for naval limitation might be made by England without the appearance of an effort to interfere with the present American building program. He thought there was "every reason to believe that a further effort would be made before long," though it might be delayed until after the English elections this summer. After Sir Esme's statement, Foreign Minister Chamberlain hastened to announce that the situation was "in no way changed," but the British press continued to advocate new efforts toward a settlement, based on broader lines than those of strict mathematical parity.

NAVAL POWER AND NEUTRAL TRADE.—In the *Saturday Review of Literature* of February 16, Mr. Henry Kittridge Norton (author of *Simsadus*) comments interestingly on two recent books, *A Survey of American Foreign Relations* (1928), edited by Charles P. Howland and published for the Council of Foreign Relations by the Yale Press, and *Foreign Relations of the United States (1915), Supplement*, Government Printing Office, 1928. Of the five sections into which the first volume is divided, the most interesting, according to Mr. Norton, is the one written by Arthur Bullard on the post-war movement toward limitation of armament. On this he comments as follows:

> Mr. Bullard has given us an extremely able presentation of the real issue between England and the United States on the question of naval parity. British opinion on this matter has so far been shaped by the Admiralty. The Admiralty's conception of the British navy is that of an instrument which under their direction can control the seas in time of war. This control has two purposes. First, to insure the uninterrupted supply of foodstuffs and raw materials to Great Britain in time of war, and second to interrupt the supplies of such material to Britain's enemies. This control is exercised in two ways. First, by the destruction of the hostile fleet, and second by the blockade of hostile ports.
>
> The conflict of interest between the United States and Great Britain centers round the use of the blockade. America has for the most part been a neutral in European conflicts. She has desired to trade with both parties. So long as the British navy controlled the seas, she has been able to trade with Great Britain. She has not been able to trade with Britian's enemies except on terms fixed by the British navy. In the old sailing-ship days munitions of war were considered contraband and certain supplies including foodstuffs were contraband if they were destined for the use of the armed forces of a belligerent. In other goods neutrals were supposed to have the right to trade with either belligerent without interference from their armed forces. In modern warfare, fought by nations in arms, any sort of supplies helps to stiffen the resistance of the nation receiving it. When that nation happens to be at war with Great Britain, and the British navy controls the seas, it requires only an Order in Council dictated by the Admiralty to extend the law of contraband to exclude practically all commerce with the enemies of Great Britain.
>
> There are but two possible checks upon the arbitrary exercise of such power to control the seas. One is international law. This for the present, so far as the question of the freedom

of the seas is concerned, is practically non-existent. The other check is a neutral navy sufficiently powerful so that the British Admiralty would prefer to sacrifice some of the advantages of its sea power rather than bring this neutral navy into the contest against it.

If those of a pacifist turn of mind are inclined to think that Mr. Bullard is merely supposing fictitious difficulties and imagining chimeras, they might well turn to the second volume under review and read of what actually happened during the year 1915 when we were neutrals and the British and the Germans were locked in a death struggle for the control of the sea. It was the British who first violated American rights as those rights are defined by American interpretations of international law. The British navy took what seemed to us utterly unwarranted liberty with our commerce, and the volume is rich in material for the consideration of those who belittle the differences between England and America. Our navy at the beginning of the War was not overly powerful, not sufficiently powerful, in fact, to deter the British Government from deciding to give its own navy a free hand in suppressing any trade which might in any way redound to Germany's advantage.

Then came the submarine campaign. Germany claimed it was by way of "reprisal" against Britain for her violations of international law. But the United States, a neutral, suffered from the reprisals in exactly the same way that Britain, the enemy, suffered. Furthermore, the British had interfered only with American ships and cargoes. The form of the German campaign resulted in the sacrifice of American lives. Its violation of international law, even though there was some justification for the "reprisal" claim, aroused the resentment against Germany in this country which finally took us into the War on the side of the Allies. It is impossible to say how history would have been changed if we had had in 1915 a navy such as we were acquiring when the Washington Conference was called.

ANGLO-AMERICAN RELATIONS.—The *Saturday Review of Literature*, in its issues from January 26 to February 16, carried a highly valuable series of articles on the subject "England and America," discussing from various angles the problem of future relations between the two countries, especially in their relation to naval power and commerce. The first articles, contributed by Sir Philip Kerr, former private secretary to Premier Lloyd George, expressed a fairly hopeful opinion that the two nations could work out harmoniously the great problems of international trade rivalry facing the world in the future. Another article by Mr. Walter Lippmann, an editor of the New Yonk *World*, put forth the general idea that naval equality, as between the two countries and on the basis of something like their present strength, offered the best basis for future peace. A subsequent letter contributed by the military critic and historian F. H. Simonds was more pessimistic, pointing out the fundamental and scarcely reconcilable divergence of policies between the two countries as regards control of trade in war time. An extract from Mr. Kerr's article of February 2 is given below:

It is sometimes said that an irrepressible conflict must arise between Great Britain and the United States and other leading economic powers, each struggling for the raw material supplies or for the lion's share of the markets of the world. There will be competition and friction, no doubt, but there need be no irrepressible conflict if wisdom governs their policies. The world is on the verge of an expansion of production and exchange hitherto undreamed of—an expansion which will keep all the industrial nations fully employed on a rising standard of living for an indefinite period, if the leading nations can prevent war among themselves. The equipment with power and machines of the 1,200,000,000 of the human race now mainly dependent on human and animal energy will give them a producing and therefore a consuming capacity which will not only immensely heighten their own standard of living, but create a world market immeasurably greater than any yet conceived. If the industrial nations, following the intelligent capitalism of the modern era, recognize that the key to their own problems is not internecine competition for a limited market, but the intelligent expansion of the world market through judicious investment and good wages, and the rationalizing of competition within it, no irrepressible conflicts need arise. . . . .

International relations in economic affairs for the next few years seem likely to be dominated by the controversy between those who believe in the nationalist or protectionist and subsidizing policy and those who see far greater prosperity for everybody in international coöperation for the all round reduction of tariffs, subsidies, and other restrictions to normal commercial intercourse all over the globe.

The second group of economic problems goes deeper. The equipment of the whole world with machinery will bring into being international, financial, and business organizations more powerful than many pre-war governments, and these international organizations will be entirely beyond the control of any government or people. The greater proportion of this colossal wealth will remain in relatively few hands, for, though poverty is disappearing, the proportion of wealth in the hands of the rich and the relatively poor seems to remain fairly constant. Moreover, these gigantic trusts and combinations are not only beyond the control of governments but also of the shareholders who draw dividends from them. The power over finance and industry today is almost as absolute and as autocratic as was the power over political government in the days when feudal barons and hereditary kings were preparing the ground for the modern Parliamentary states.

UNITED STATES AND LATIN AMERICA

MEXICAN PRESIDENT ATTACKED.—An unsuccessful attempt was made on the life of President Emilo Portes Gil of Mexico when a train on which he was traveling was dynamited on the morning of February 10. Although two coaches were derailed, that in which the president was traveling was uninjured. The attack took place on the day following the execution of President-Elect Obregon's assassin, Toral.

TACNA-ARICA SETTLEMENT.—Reports from both Chili and Peru in the latter part of February indicated real progress toward settlement of the Tacna-Arica problem by means of direct negotiations between the two nations. The proposed settlement, it is stated, will divide the two provinces, giving Tacna to Peru and Arica to Chili. The railway from the port of Arica to Bolivia will lie just within Chilean territory.

NICARAGUA CANAL SURVEY.—The Edge Resolution providing for a survey of the interoceanic canal route through Nicaragua passed the Senate on February 25 and was later approved by the House and signed by President Coolidge. It provides for an initial appropriation of $150,000 and further appropriations as necessary. The resolution calls also for investigation of the possibility of enlarging the Panama Canal and for consideration of "any other practicable route between the Atlantic and the Pacific."

REPARATIONS CONFERENCE

PROGRESS MADE.—The first meeting of the expert committee of representatives of the seven nations concerned in the problem of German reparations met at Paris on February 11. As anticipated, Mr. Owen D. Young of the American delegation was made chairman. During the first week or two the time of the conference was chiefly spent in listening to a detailed account of conditions in Germany, by the chief of the German delegation, Dr. Hjalmar Schacht, President of the Reichsbank, whose efforts were bent on refuting the statement of Mr. Gilbert's report that Germany could easily pay the standard annuity of $600,000,000 called for under the Dawes Plan. The German delegate took especial pains to point out that the recent large American loans to Germany, which have facilitated previous reparations payments, constitute an additional burden on the country, and an additional argument against making future payments beyond her ability to bear. On February 27 a subcommittee composed of Herr Schacht and Sir Josiah Stamp of the British delegation presented a preliminary report bearing on the question whether the "transfer clause," allowing Germany a certain option in payments if such transfer would injure German credit, should be retained in future arrangements. Although not made public, this report was said to recommend that while about 75 per cent of the payments each year should be fixed, the transfer of the remainder should be subject to the decision of an international body of financial experts. Committees were appointed to consider the amount of both fixed and varying payments, and the application of the transfer clause to payments in kind. This last committee was headed by Mr. T. N. Perkins, one of the American alternate delegates, who arrived at Paris on February 23.

Despite the difficulties of the problem, very optimistic opinions were expressed by members of the conference to the effect that definite results would be reached by the committee within five or six weeks' time.

ITALO-PAPAL TREATY

CONCORDAT SIGNED.—The treaty between Italy and the Vatican renewing diplomatic relations and restoring the temporal sovereignty of the Pope was signed at the Lateran Palace in Rome on Sunday, February 18, by the papal Foreign Secretary, Cardinal Gasparri, and by Premier Mussolini. Of chief interest in the treaty is the recognition of the sovereignty of the Holy See within the small area of the "City of the Vatican," now a neutralized state; the renewal of cordial relations between the Pope and the Italian government; and the provisions for modification of the Italian civil law in matters of marriage, divorce, etc., so as to bring it into harmony with canon law. For injuries incurred in 1870 and later, the Italian government will pay 200,000,000 lire in cash and bonds (about $105,000,000) to the papal treasury.

SOVIET REPUBLIC AND NORTHERN EUROPE

BALTIC PEACE PROTOCOL.—The signing of a peace protocol on February 9 by the Soviet Republic, Poland, Latvia, Esthonia, and Rumania, was varyingly described, in the Russian press as a "proof to the world of Soviet pacifism," and in the foreign press as "a crowning piece of Red hypocrisy." The pact put into effect at once among the four signatories the provisions of the Kellogg Anti-War Treaty, without delay for ratification by other powers. Of especial interest was the presence of the Rumanian delegate, the first to appear in Moscow since the war. Rumanian adherence to the agreement was said to have been secured only by a definite renunciation on the part of the Soviets of all claims on Bessarabia. Possibly this was accomplished by secret agreement, for at the signing of the peace protocol the Soviet delegate declared the Bessarabian question "not finally settled."

EXPULSION OF TROTZKY.—After much mystery as to the whereabouts of Leon Trotzky, who since January had been reported expelled from the Soviet Republic, it was finally ascertained that he had reached Constantinople, February 12, from Russian Turkestan aboard the Soviet steamer *Illitch*, and was living at the Soviet consulate under a strong guard. Subsequently the German government received and rejected an application from Trotzky to take up temporary residence in Germany. In the New York *Times* of February 27-March 1 appeared an account by the Russian minority leader of his struggle with Stalin and final expulsion from the country. Stalin, as might be expected, was characterized by Trotzky as a politician of mediocre ability and shifting policy.

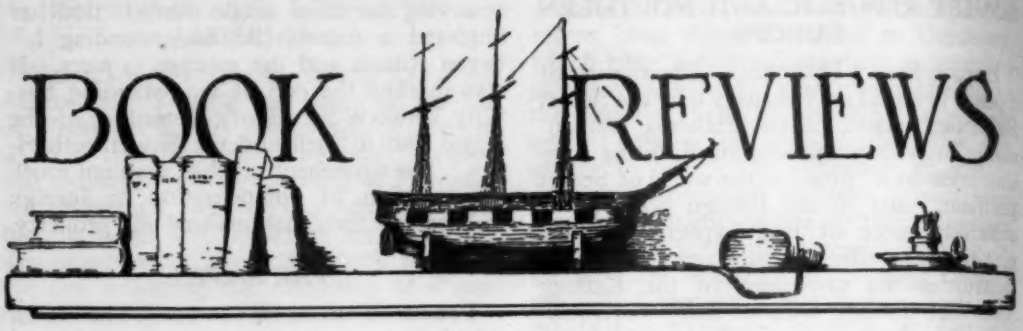
OIL AGREEMENT SIGNED.—The signing in London on February 27 of a three-year agreement between the Soviet oil control and the leading British and American oil companies (Anglo-Persian, Royal Dutch Shell, and Anglo-American) for resumption of normal trading relations was regarded as removing the chief single obstacle that has hindered a commercial understanding between Russia and the western powers. It also marked the end of long-standing hostility between Sir Henry Deterding of the Royal Dutch Shell and the Soviet authorities. The agreement reached does not touch the question of compensation to foreign owners for their nationalized oil property.

FAR EAST

TARIFF TREATY RATIFIED.—The tariff autonomy treaty signed by representatives of the United States and the Chinese Nationalists last August was ratified by the United States Senate on February 11. Ratification, however, was not regarded by the Nationalists as essential to putting into effect their new tariff rates, which went into force on February 1.

SINO-JAPANESE CONFERENCES.—Discussions between China and Japan over the Tsinan-fu incident and other differences followed during February their characteristically Oriental course. Substantial agreement was announced February 5, followed three days later by a statement that negotiations were again at a standstill owing to refusal of the Nationalists to waive claims for pecuniary damages resulting from the conflict at Tsinan. Meantime the disturbed conditions in Shantung strengthened Japan's justification for retaining her military forces in the province.

SHANTUNG UPRISING.—Considerable fighting occurred in northeastern Shantung during the latter part of February between Nationalist troops and followers of the former Shantung war-lord Chang Tsung-chang. Japan was accused of assisting Chang's return from Dairen to Shantung and of aiding him in launching his rebellion. Of even more serious menace to the stability of the new Nationalist government was the presence in western Shantung of a large army under Marshal Feng Yu-hsiang, as well as threats of rebellion among radical leaders in Honan province and at Hangkow.



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JANE'S "ALL THE WORLD'S AIRCRAFT," 1928.

By C. G. Gray, London: Sampson Low, Marston Co., Ltd. $12.50.

REVIEWED BY LIEUTENANT J. F. GILLON, U. S. NAVY

All the World's Aircraft, in the eighteenth year of its issue, is a comprehensive and authentic manual. The five main parts are:

1. The World's Aëronautical Progress, Civil.
2. The World's Aëronautical Progress, Service.
3. All the World's Airplanes.
4. All the World's Aëro-Engines.
5. All the World's Airships.

Each of these parts is further separated under the headings of the various countries and in turn under the manufacturers within the respective countries.

The section devoted to civil aëronautical progress traces the past year's work of each nation. It includes aërial clubs, publications, aërodromes, civil aviation organization and traffic statistics. It is interesting to note the large number of subsidized flying clubs in Great Britain, the air mail service between France and South America (in the process of development), the vast commercial airways of Germany, and the many air transport companies in the United States.

The service aëronautical progress describes in detail the military and naval organizations and the equipment used. The wide difference in the various organizations is noticeable.

The arrangement of the section devoted to the world's airplanes is orderly. Every type of recent plane is described in concise language. All descriptions are accompanied by excellent photographs. Brief mention is made of the outstanding achievements of the past year in connection with the description of the particular plane.

The engine section brings out the details of construction of the many new aëro-engines. The descriptions are accompanied by clear photographs. Recent engineering advancements are discussed.

A general survey of all aircraft in the leading countries shows that the performance characteristics are about the same. The trend in England is toward the development of many light airplanes and large flying boats, while in the United States the cabin-type landplane is predominant. France has developed many efficient types of military aircraft. Germany has specialized in huge flying boats and transport planes. Italy builds record-breaking types—speed and duration.

Metal, especially duraluminum, in aircraft construction has practically superseded the old wooden type.

The editor points out that America's progress in aviation development was greatest in 1928. In one type, however, this country is decidedly backward. The large passenger-carrying flying boat has been entirely neglected in the United States. On the other hand, Germany, Great Britain

and Italy have made great strides in its development. Due to its great possibilities in commercial aviation, it is probable that the coming year will see some progress in the United States in commercial flying-boat construction.

To sum up, this manual justly deserves being termed the standard reference book on all the world's aëronautical progress, both civil and service. It is vast in scope and correct in detail.

STRATEGY. By Captain George J. Meyers, U. S. Navy. Washington: Byron S. Adams. 1928. $3.00.

REVIEWED BY REAR ADMIRAL REGINALD R. BELKNAP, U. S. NAVY (Retired)

A subject ordinarily regarded as mostly military is treated by Captain Meyers as a principal concern of the general government. A common manner of seeing, thinking, and acting, recognized as necessary in the military services, is shown to be equally so in the larger field; for knowledge of war and of its relations to national policy are the concern also of statesmen. The author intends the book for officers of our services, but others also who are active in international affairs, whether officially or self-appointed, might read it to advantage. The presentation is clear, and the continuity of argument is aided by timely recapitulation and restatement; and despite the absence of illustrative cases, the work should interest all who would inform themselves better on some fundamentals of national welfare and peace.

Forecasting the author's use of words, phases, and quotations in their natural import, the book opens with a glossary of terms defined in their common use, to forestall a technical or narrow interpretation. In the text he subjects quotations and commonplace sayings to examination before accepting or rejecting them. Thus carefully he aims to "put things in their proper places" and "deduce those principles which rightly have a place in the conduct of a nation's international policy."

At the outset of the "Introduction" he clarifies "A nation's first line of defense is the navy" as true in operations of war but in peace not true, dangerously false, blinding at times to those in high position.

Diplomacy, statesmanship, is the nation's first line of defense in peace time. If statesmen are not on their guard, they may be beguiled in peace time into making agreements that place the nation at a disadvantage both in competition during peace and in hostile operations during war. The bloodless victories won by statesmanship during peace sometimes equal in historical importance the great decisions of war.

That "war is a mere continuation of policy by other means" makes strategy embrace diplomacy as well as armed forces. During peace sound strategy builds up a structure that may avert war or that will strengthen sea and land forces in the future, when policy passes from persuasion by words to decision by force., Efforts of military authorities for proper dispositions in case of war are weakened or nullified unless diplomacy and statesmanship work hand in hand with them, particularly during peace. "Diplomacy is continually part and parcel of strategy"—during peace to strengthen the national power, during war to meet the national needs as the fortunes of war dictate, and at the conclusion to secure its fruits. That "strategy is continuous" is further indicated by the necessity in peace for naval preparation—greater than on land—in readiness, disposition, concentration, bases, and a flourishing shipbuilding industry in reserve; all these greatly influenced by the attitude of statesmen.

One may comment that the recent multilateral renunciation of war as an instrument of policy may necessitate reformulation of the quoted definition of war; for compelling reasons may continue a policy in spite of armed threat and opposition. Still the part of diplomacy will continue and the responsibility of statesmen be as great as, if not greater than, ever.

As to where strategy ends and tactics begin—it is when we engage in battle to surmount armed resistance. Strategy should use the victory to gain the purpose of the war. "But do not let us fall into the habit of thinking that this is all that strategic success depends upon." There are other things, gained in peace or without fighting, such as positions, networks of transportation, natural advantages, terrain, climate, moral and material superiority.

The author recapitulates: strategy is as necessary in peace as in war. It is continuous. Diplomacy is one of its instruments. Policy controls because it fixes the purpose. Therefore the statesman directs. His instruments are diplomacy, the navy,

the army. How necessary for him to know how they are to be applied to the purposes of policy! To know whether they are sufficient for his needs! To lend his efforts towards strengthening them! He alone is answerable for the decisions that lead to war. He only has the power of declaring war. The conduct of war is his by the Constitution. On him alone rests the responsibility for peace and war.

The discussion establishes the definition, "Strategy is the provision, preparation and use of diplomacy and of the nation's armed forces in peace and in war to gain the purpose of national policy."

War is the province of danger, uncertainty and chance. . . . . It behooves those in the military profession to train themselves better to meet the uncertainties of war and to reduce its hazards, ... to learn the nation's interests, so that weapons may be adequate to the task, properly disposed to avert conflict or, if war is inevitable, to gain initial advantage. Fixed rules or laws cannot be laid down to follow in all cases for executing war tasks, but there are principles and system that will help to create power and increase the chances of success when we apply it. The test of such principles is of broad application, yet they should apply to any particular situation. They are correct if we may base on them a correct line of action at all times, in providing, preparing and driving that triad of a nation's forces—diplomacy, the navy, the army.

Chapter I, one-seventh of the whole text, treats of "Strategy in the Realm of Statecraft"; not strategy in peace alone, "because war, no less than peace, is a realm in which statesmen act. In both fields, statesmen cannot take their hands off the situation for an instant." It is made clear that responsibility for initiating military preparedness, not merely consenting to and maintaining it, rests with statesmen.

As other means than armed force to gain the purposes of policy, statesmen use negotiations for small concessions, which, added up, make the whole concession desired; skill in using this "law of lesser concessions" being "to a great extent the measure of statesmen's worthiness to exercise the offices of statecraft." War being a costly method is justifiable even as a last extreme only when the other method has been tried skillfully and has failed.

When statesmen so decide on war, "they cannot wash their hands of the matter and blame the cost on naval and army leaders. These must still have their support. Because war is not popular and because it is violent, bloody and destructive are no reasons why those responsible for bringing it on should not be held to their responsibility . . . . nor why those responsible for bringing it to a rapid and successful conclusion should be ignored in their recommendation for adequate forces to prosecute war." In the fuller discussion of adequate forces later, the author holds that, if the military leaders fulfill their responsibilities in the matter, "it is not to be conceived that they will not receive the wholehearted support of the civil establishment charged by the Constitution with providing adequate means for national security."

To "achieve success in war, the armed forces as well as diplomacy look to a directing head to state the purpose, so that intelligent action may result in providing and preparing adequate forces of suitable types and arms, in making peace-time dispositions that will best meet the eventualities of war, in creating organization that will fix the relation of the interdependent task groups, and in issuing in the form of war plans instructions that are the basis for initial action in war. That is, when we are called upon to use the armed forces, we want to be prepared to use them most effectively, so that we can more quickly hand back to statesmen the advantage they desire to gain by war and allow them to use that advantage in the peace-time pursuits of the nation." This paragraph outlines the "principles and system that will help to create power and increase the chances of success when we apply it." Eight principles are deduced.

As Constitutional commander in chief and also the giver of guiding impulse to the State Department, the President is the one to decide. The diplomatic and the armed agencies of policy, and others as well, advise in their respective spheres, "but no matter who advises nor what the extent of the advice, the decisions are the President's alone." Hence the first principle, from which the others successively flow:

I. In furthering national policy, there must be a head clothed with the authority and charged with the responsibility of stating the purpose to be achieved, in order that intelligent direction may be given to the national effort to be applied.

For sound decisions, sound advice, matured by estimates of the situations probable under our own and other nations' policies, studied in the light of history and

present indications of future development. Whether policies relate to security or prosperity, statesmen must first weigh their value and cost; for once diplomatic effort is started, it may not be possible to halt it. How far are we willing and able to go against opposition? Shall effort be only diplomatic, or have naval support or army reinforcement, or both? These questions are not for military men to decide but to advise upon. From the decision of the chief executive flows all our planning. Without the correct premise, all our efforts to provide, prepare, and operate may prove no more useful in war than abstract study based on assumptions that do not exist. Hence—

II. In any national policy there must be a well-defined purpose, measured by its value to the nation and by the effort it will cost in its attainment.

The interest of statesmen in national preparedness is a compelling one; for unless our means are adequate for war, whether of our own or the enemy's causing, we are likely to fail. "It must be remembered always that we should be ready to act with the chances of success on our side"—so he states repeatedly, as the guaranty against war. Place, as well as number, affect adequacy. Hence the two principles:

III. There must be forces adequate to achieve the purpose in view; these forces must not be allowed to fall below the standard fixed strength in men, material and morale.

IV. The forces provided must be of types or arms suitable to the theater of operations and equipped with weapons to overcome the weapons of the probable enemy.

The study of possible theaters of war, from which to determine the composition of armed forces, while of initial concern to military men, concerns statesmen also, in regard to bases, peace-time dispositions affected by political considerations, alliances, and efforts by possible enemies to gain positions on our supply lines. Hence—

V. A disposition of our armed forces must be made in time either to make war unattractive to our possible enemies or to gain for us advantages at the outbreak of war; it should provide for uninterruption of supplies to the armed forces in the field.

The other three principles relate to inspection in the most comprehensive and continuous sense; to organization for success with least cost; to instructions by the directing head to all task groups. Under the successive principles, the control becomes more and more military, but always with due regard to coöperation with diplomacy and in conformity with the decisions from above. Enough has been summarized to show how the intimate connection of diplomacy and armed forces, statesmen and military, is kept in view.

The next, a considerably longer chapter, treats "Strategy in War," already defined by adapting the comprehensive definition given before. The author rejects the common acceptance of "The objective should be the enemy armed forces wherever they may be," as dangerously narrow; strategy making use not only of victory in battle but also of all other things that may impede the enemy and favor our cause. The purpose of the war being a decision of the President's, all acts of war must be subservient to it, down to tasks designed to gain a minor advantage. Peace unopposed being the new situation we are striving for, all steps must build for that future, just as in peace time the lesser concessions gained by negotiations sum up into the large concession desired. In this chapter the same eight principles are successively deduced from the military standpoint.

Succeeding chapters on "Command," "Purpose," "Adequate Forces," "Suitable Arms (or Types) and Weapons," "Dispositions in Time," "Inspection," "Organization," and "Instructions," discuss the eight principles successively, in the style of aphorism with liberal quotation—freely so acknowledged, whether or not so marked.

"Success rests upon responsibility carrying with it sole authority." "Unity of command means more than one-man control." "Neighborly conduct between units spells team-work. . . . . Unity of command includes unity of action." The outstanding qualities of great leaders are "Knowledge; courage; tenacity of purpose; energy; the ability to indoctrinate all subordinates—to impart his methods to all those under him so that they will act, when the freedom of the initiative is theirs, understandingly as the commander would act were he present; the ability to instill into the organization the moral stamina that results in the will to win; freedom of mind; the ability to manage." The "Command" chapter includes statesmen, for the requisite qualities for directing the nation and for their respon-

sibility for choosing competent commanders. So in other chapters, the interest and responsibility of statesmen are made plain.

Each of these chapters ends with a concise summary of the heads, subheads, and points discussed; and these eight summaries are assembled on one sheet as an appendix, classified under "Methods," "Factors," "The Application of Power," and "Relations with Logistics and Replacements," an instructive and useful chart.

The final chapter is on "The Combat," discussed by application of the eight principles, which are thus as a whole tested by a particular case. This chapter is in effect a synopsis of principal considerations, stated or in quotation form.

Last comes a "Reading Course," a fundamental one leading to wider fields by the interest it is sure to stimulate. It is well arranged, by subject and by title; comprehensive for its purpose; and kept clear of propaganda.

The treatise as a whole is well balanced, presenting the functions, interest, and mutual relations of statesmen and military in better proportion and more thoroughly than is usual in such writings. Altogether an admirable work, evidently the result of much thoughtful study and great pains. It will repay reading several times reflectively; and many officers will wish to possess a copy, as a guide and convenient compendium in connection with other reading.

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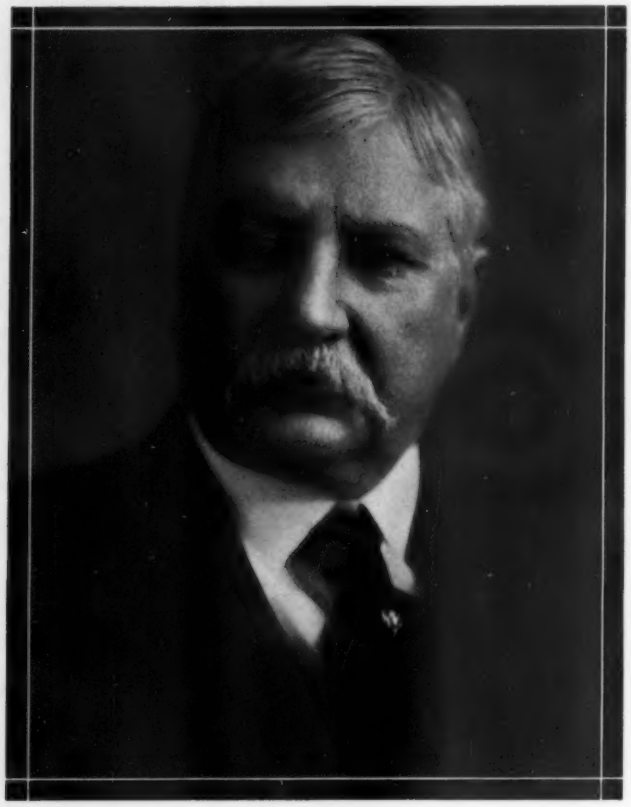
Courtesy H. F. Krafft

A FAST CONVOY

Depicts the U. S. S. Destroyer *Allen* escorting the troop transport *Leviathan* through the danger zone in typical rough weather. Speed 23-26 knots. The second of a series of paintings by Burnell Poole, presented to the Naval Historical Foundation by the Dupont Co., and loaned by the foundation to the U. S. Naval Academy.



Distinguished Naval Academy Graduates in Civil Life

Ernest Wilkinson

ERNEST WILKINSON was born and reared in Louisiana, and graduated from the U. S. Naval Academy in 1880.

During the first ten years after graduation, he made a cruise to the Arctic in the U.S.S. *Alliance* in search of the *Jeanette;* he served two years at the Smithsonian Institution and in the U. S. Geological Survey; while in the survey, he steered a government mule through about three thousand miles of difficult navigation in the Rocky Mountains; he made a cruise on the Asiatic Station, and around the world; he was an instructor at the Naval Academy; and was admitted to the Bar.

In 1890, he resigned to join the eminent patent lawyer, Charles S. Whitman, in the law firm of Whitman and Wilkinson.

After Mr. Whitman's death in 1896, the firm was enlarged from time to time, to take care of increasing work, and became Wilkinson, Fisher, Witherspoon, and Mackaye, all three junior partners being now dead.

In his large law practice, he has represented a host of naval officers in securing and litigating patents. He is a life member of the U. S. Naval Institute. He was president for some years, and was then elected president emeritus, of the Louisiana Society of Washington.

His son, Commander Theodore S. Wilkinson, U. S. Navy, graduated from the Naval Academy in the class of 1909.

Mr. Wilkinson is still in active practice of patent and trade-mark law at 805 G Street, N. W., Ouray Building, Washington, D. C.

SECRETARY'S NOTES

The annual meeting

At the annual meeting of the U. S. Naval Institute, held last February, the results of the balloting showed the following to have been elected to office in the Institute:

President—Rear Admiral S. S. Robison, U. S. Navy.
Vice President—Rear Admiral W. H. Standley, U. S. Navy.
Secretary-Treasurer—Captain R. C. MacFall, U. S. Navy.
Directors—Brigadier General George Richards, U. S. Marine Corps
Captain E. J. King, U. S. Navy.
Captain J. N. Ferguson, U. S. Navy.
Captain G. V. Stewart, U. S. Navy.
Commander H. S. Howard (CC), U. S. Navy.
Commander R. M. Brainard, U. S. Navy.

More ballots were cast than ever before, nearly half the regular membership registering their votes. This shows a healthy interest in the affairs of the Institute.

Rear Admiral E. W. Eberle, U. S. Navy, now retired, thus also retires from the presidency of the Institute. The Institute was honored in having a man who had occupied so many of the high positions in the Navy for its president. Admiral Eberle may rest assured that the best wishes of the entire membership of the Institute, as well as of the whole Navy, accompany him in whatever he undertakes.

The Secretary's report shows that the business of the Institute amounted to almost $100,000 for the past year and that this business was conducted at an operating loss of a little over $600, as close to operating at cost to the members as it is possible to estimate. Interest on bonds and bank deposits converted this operating loss to a net profit of a little over $8,000. The financial statement appears in the last two pages of the Secretary's Notes.

The prize-essay contest

The prize-essay contest for 1929 was won by Lieutenant Franklin G. Percival, U. S. Navy (Retired), Class of 1914, U. S. Naval Academy. The Board of Control awarded a cash prize of $400, a gold medal, and a life membership in the Naval Institute. This prize was won over a large field of contestants. The essay is published in this issue as the leading article.

Honorable mention was given an essay by Captain D. W. Knox, U. S. Navy (Retired), on "The Navy and Public Indoctrination." This carried with it an honorarium of $250. It is intended to publish this essay in the June issue of the PROCEEDINGS.

The Board of Control decided to hold this contest again next year and the notice is published elsewhere in the PROCEEDINGS. It is believed that the offering of these prizes

is accomplishing its purpose, namely, stimulating interest in writing throughout the naval service.

New Institute publications

Three new books have recently been brought out by the Institute:

Internal Combustion Engines has been completely revised and is more elaborately illustrated than ever before. Plates in colors indicate the oiling and cooling systems, making the book more valuable. It had already received much favorable comment. Price $3.40, less 10 per cent to members.

Naval Aviation, just off the press, completely revised and newly illustrated. Aviation makes such rapid strides these days that the Naval Institute feels justified in revising this valuable book frequently. Price $1.75, less 10 per cent to members.

Around the World with the Fleet—There was an unexpected delay in printing this book. We hope that by the time this issue of the PROCEEDINGS reaches you, those of you who have ordered this book will have received it. The semiflexible cover had to be abandoned on account of the weight of the book. However, we believe it measures up to expectations. It will make an excellent present. Price $3.50; to members, $3.00.

A new commander in chief

A new administration is now in authority. President Hoover is our commander in chief, having relieved former President Coolidge. But the Navy carries on as ever. The same loyalty, the same devotion to duty, the same willingness to sacrifice self for country actuates the service. It is a wise provision in the affairs of this country that keeps the military services divorced from politics.

Membership

The net increase in membership for the year was nearly 850. This is a healthy growth and should be maintained. Our circulation is now 7,200, and growing.

The best results come from names submitted by our members. So do not stop this valuable assistance, for we want to keep on growing. If we may believe what is written to us, the PROCEEDINGS is well received by its readers. And keep on sending us pictures of things of interest. Snapshots often make beautiful full-page engravings. Also, write on the back of each picture information about the picture that will help us in preparing the legend. You would be surprised how you can assist us in making the PROCEEDINGS interesting and beautiful. Besides, it is *your* magazine, and you should take part in producing it.

The Coast Guard issue

Next month the PROCEEDINGS will feature the Coast Guard. It is just as necessary for the Navy to know this sister-service and what it does as it is for the Coast Guard to know about the Navy.

Rear Admiral Billard and other officers of the Coast Guard have coöperated with us in preparing articles and furnishing illustrations for what we believe will be one of the most valuable, interesting, and beautiful issues we have brought out.

Estimating the situation

One of our associate members raised the point that, when our new cruisers were built, the United States would in reality have a stronger cruiser force than the British, due to the greater number of guns carried on the 8-inch cruisers of the United States. This is a reasonable query and it is thought that an analysis of the Washington Conference type of cruisers of the

two navies might not be amiss, an analysis made not on any particular information in regard to the ships of either of the two navies, but made on general principles.

In making a comparison we must accept the following principles:

(a) That the naval constructors of the two countries have equal ability;
(b) That the ordnance engineers produce equally efficient guns and mounts;
(c) That the engineers produce equally efficient engines.
(e) That the personnel of the ships have equal fighting efficiency.

In comparing the fighting strengths, we must accept certain laws of combat, namely, that the fighting strength of a ship is equal to the product of its ability to hit times its ability to stand punishment; that between groups of ships, the combined fighting strength is a product of the sum of their ability to hit times the sum of their ability to stand punishment.

Both of these laws are reasonable, for a single ship with ten guns can do twice as much damage as one with five guns, and a ship that can stay afloat an hour can do four times as much damage as one that can stay afloat only fifteen minutes, gun power being equal. Also, the effect of two ships "ganging up" on one is greater than if they engaged in succession. The same is true in street fights.

Now, let us take the *Salt Lake* type of cruiser and use it as a basis of comparison, letting her hitting power equal 1.0 and her power of taking punishment (life) equal 1.0. She carries ten guns or one gun for every 1,000 tons. Let all of the United States ships be of this type. Then the combined life of our twenty-three cruisers is 23 and the combined hitting power is 23; their combined fighting strength is 529.0.

Now let us take up the British ships. They are divided into three types: the *York*, 8,400 tons, carrying six guns; the *Kent*, 10,000 tons, carrying eight guns; the *Birmingham*, 9,800 tons, carrying seven guns (7.5-inch).

Using the *Salt Lake* class as a basis of comparison and making allowance to the *Birmingham* class for mounting 7.5-inch guns instead of 8-inch, we have the hitting power of these three types as follows:

Yorks	0.6	×	6 equals	3.6
Kents	0.8	×	15 equals	12.0
Birminghams	0.577	×	4 equals	2.3
			Total hitting power	17.9

The ability to stand punishment (life) is more difficult to ascertain. Take the *York* class, 8,400 tons and carrying six guns, or an average of one gun for each 1,400 tons displacement. What is done with this extra 400 tons per gun or 2,400 tons per ship? Is it ballast? No, that would be foolish. It is employed in giving extra protection to the ship in the shape of armor and compartmentation; in other words, increasing its defensive features, increasing its life. England could have mounted one gun for each 1,000 tons, but preferred the extra protection. In other words, the United States design strategy emphasized offensive features while English strategy emphasized defensive features. The British invested 55,000 tons of her total 239,000 tons in extra protection, thereby increasing the "life" factor of the formula "Hitting Power times Life equals Fighting Strength." The 8,400-ton *York* class is being completed after the 10,000-ton *Kent* class and this choice was made by the British after mature deliberation.

We may assume, then, that the tons saved were used to increase the life. And the

added life may rationally be estimated as proportionate to tons saved. Otherwise, British design strategy is not as good as ours.

Now, assuming that an 8,400-ton ship has a life of 0.84 as compared to the life of 1.0 of a 10,000-ton ship, and assuming that this life is increased 2400/6000 due to the increased protection; then the life of the *York* class is 1.18 (0.84+[24/60×.84]=1.18.)

Using the same reasoning, the life of the *Kents* is 1.25 and of the *Birminghams* is 1.37.

The life of the British cruisers is, then:

Yorks	1.18	×	6 equals	7.08
Kents	1.25	×	15 equals	18.75
Birminghams	1.37	×	4 equals	5.48
			Total life	31.31

Twenty-five British ships (239,000 tons)

Hitting Power (17.9) × Life (31.3) = 560 Fighting Strength.

Twenty-three United States ships (230,000 tons)

Hitting Power (23) × Life (23) = 529 Fighting Strength.

An amazing result? No! It is correct under the assumptions. (We have invested in offensive features, while the British have sought defensive features.) Whether British shipbuilding strategy is superior to our strategy only war would tell, and Heaven knows no one wants a war between these two peoples.

So the two nations are *nearly equal in the Washington conference type* of cruisers *when* and *if* our twenty-three are completed, and *if* Great Britain does not build beyond those already built, laid down, or scheduled to be laid down.

In *pre-Washington Conference types,* Great Britain has thirty-nine cruisers (181,000 tons) to our ten *Omahas* (75,000 tons). If equality is desired and if Great Britain has cruisers too small to be of use, as opponents of the cruiser bill have stated, here would be a good chance to scrap them, or at least enough of them to bring Great Britain to a position of equality. It would be eminently fitting for someone else to scrap ships this time.

The "Constitution" in miniature

Professor Herman F. Krafft, curator at the Naval Academy, has written the following interesting article on a model of the U. S. frigate *Constitution,* several very unusual pictures of which are shown on Plates LI to LVI, this issue.

With the death six months ago of Lieutenant Colonel William F. Spicer, U. S. Marine Corps, in his seventy-eighth year, there passed the builder of the most minutely accurate and the most artistically beautiful models of the frigate *Constitution* in existence. These models are sources of wonder to old salts of the days of wood and sail and to all lovers of the romance of the sea. The story has often been told of a naval officer, who had served on the *Constitution,* and who on being shown the photograph of Spicer's model under way, exclaimed, "Sir, it is a d—— shame to risk that old ship at sea; she is in no condition to go out under sail and will surely be sunk."

Colonel Spicer, after his retirement, successively built two models of the old frigate, a labor of love that kept him busy a dozen years. His task required much research, ingeniously delicate tools, and infinite patience and skill. The models are now on exhibition in the Marine Museum and in the Museum of Fine Arts in Boston. Mr. J. Tem-

pleman Coolidge, an old friend of Colonel Spicer and the vice president of the Marine Museum, has contributed to its archives a brief biographical sketch, entitled "In Memory of Lieutenent Colonel William Francis Spicer, U. S. Marine Corps." In this brochure Mr. Coolidge summarizes the colonel as "A man of rare character and varied talents, 'A gallant gentleman, poet, musician, painter, and masterly craftsman'." And he continues:

> From inheritance as well as from boyhood associations, the call of the sea was in his blood. This boyhood was spent at the Charlestown Navy Yard when his father was in command. There, running free, he came across the old ships in dock which appealed to his eager imagination; and, frequenting the yard shops, the men, whose interest was aroused by the boy, taught him the use of tools, which was to serve him well in later years.
>
> His grandfather, Peter Worthington Spicer, was a midshipman in the war of 1812; his father, Commodore William F. Spicer, served through the Civil War; he himself, in command of a company of marines, was in action with the landing forces at Guantanamo in the Spanish War; while his association with the Navy included service on board the *Brooklyn* in China during the Boxer Rebellion; on the *Swatara* in the East, and later on board the *Kearsarge*, the *Atlanta*, the *Chicago*, and a second time on the *Brooklyn*, which ended his service at sea.

Like the famous ship-modelers of the sixteenth century, Colonel Spicer combined with his craft the rare skill of the artist. This is apparent especially in his drawings and paintings of his models, which were made so cleverly that, as said before, many older officers have taken them for pictures of "Old Ironsides" herself. In a letter to the writer, Colonel Spicer described his methods in sailing and photographing his miniature *Constitution*. "The pictures," he says, "represent the ship actually sailing—some of them in the open sea halfway between Portsmouth and the Isle of Shoals, New Hampshire. The model was fitted with false keel and had ballast inside her hold, the weight of which, added to that of the keel, was about six pounds." Of the pictures showing the model in a heavy sea, Colonel Spicer explained: "These were taken when the wind was too high to trust her in the water. The ship had been placed in her cradle on the rocks so that the horizon appeared at the proper height. She was weighed down with heavy stones to keep her upright while the high wind distended her sails. The rocks in the foreground were eliminated. The sea was made to suit the amount of sail carried, and then negatives were made from my drawings."

In this same letter Colonel Spicer offered (as was characteristic of his generous spirit) to give further details regarding the *Constitution's* rigging, etc.—information which represented the work of years of study and research. In some respects, he explained, his model differed "from the present restored (?) *Constitution* but is nevertheless strictly according to her original plan made by Joshua Humphreys." Indeed, his models were built so accurately and so true to scale, that they could be used—as such models originally were used—to construct from them a new full-sized frigate. In other words, if by some accident like fire the *Constitution* herself were destroyed, from Colonel Spicer's models a new "Old Ironsides" could be created, true in every detail to her original designer's plans.

Annual Financial Statement

UNITED STATES NAVAL INSTITUTE
ANNAPOLIS, MARYLAND

Balance Sheet, December 31, 1928

ASSETS			
CASH in banks		$ 21,602.51	
ACCOUNTS RECEIVABLE			
Dues in arrears	$ 915.61		
Advertisements	858.08		
Book sales	2,325.93		
Accrued interest	2,647.64	6,747.26	
OTHER ASSETS			
Bonds at Cost		163,559.59	
Inventories			
Institute publications	$ 34,225.51		
Purchased books	9,441.74	43,667.25	
Furniture and Fixtures		1,980.00	
Miscellaneous			
Donation—Naval Historical Foundation	$ 1.00		
Envelopes	1.00		
Books charged off	1.00		
Photographs charged off	1.00	4.00	
Prepayments			
Royalties	$ 59.92		
Expense	312.75		
Manuscripts of articles awaiting publication	1,744.72		
Frontispieces and engravings awaiting publication	1,693.78	3,811.17	
LIABILITIES			
ACCOUNTS PAYABLE			
Various dealers	$ 4,165.02		
Accrued royalties	492.80		
Naval Historical Foundation	125.00		$ 4,782.82
PREPAYMENTS			
Dues	$ 12,283.44		
Subscriptions	1,676.95		
Sundries	352.15		14,312.54
RESERVE for UNCOLLECTABLE DUES			1,500.00
DEFERRED CREDITS			
Contingent profits			11,679.77
SURPLUS			209,096.65
		$241,371.78	$241,371.78

UNITED STATES NAVAL INSTITUTE
ANNAPOLIS, MARYLAND

Statement of Profit and Loss for the Year Ended December 31, 1928

"PROCEEDINGS"			
Sales	$ 2,795.02		
Income from dues and subscriptions	20,721.21		
Income from advertisements	11,941.22		
TOTAL INCOME FROM "PROCEEDINGS"		$35,457.45	
Publishing cost	$ 39,104.00		
Payments to authors of articles	3,950.09		
Prize essay awards	150.00		
TOTAL COST OF "PROCEEDINGS"		43,204.09	
LOSS ON "PROCEEDINGS" (excludes overhead)			$ 7,746.64
INSTITUTE PUBLICATIONS			
Sales		$ 51,844.05	
Inventory January 1, 1928	$ 29,051.52		
Purchases	31,172.13		
	$ 60,223.35		
LESS: Inventory December 31, 1928	34,225.51		
	$ 25,998.14		
Payments to authors	3,206.65		
TOTAL COST OF INSTITUTE PUBLICATIONS SOLD		29,204.79	
		$ 22,639.26	
PLUS: Contingent profits		1,735.68	
GROSS PROFIT ON PUBLICATIONS (excludes overhead)			24,374.94
PURCHASED BOOKS			
Sales		$ 10,838.47	
Inventory January 1, 1928	$ 2,474.99		
Purchases	14,762.37		
	$ 17,237.36		
LESS: Inventory December 31, 1928	9,441.74		
TOTAL COST OF PURCHASED BOOKS SOLD		7,795.62	
GROSS PROFIT ON PURCHASED BOOK (excludes overhead)			3,042.85
GROSS PROFIT FROM OPERATIONS			$ 19,671.15
OVERHEAD OPERATING EXPENSE			
Postage, express and hauling		$ 1,885.14	
Office expense		1,608.40	
Moody's Investors Service		132.50	
Salaries		14,060.82	
Board meetings		1,475.68	
Advertising		566.57	
Cost of collections		21.34	
Insurance		24.83	
Depreciation (furniture and fixtures)		220.00	
Telegraph and telephone		156.44	
Auditing		200.00	
			20,351.72
OTHER INCOME			$ 680.57
Income from interest			8,951.83
NET PROFIT for year 1928			$ 8,271.26

Special Notice

Naval Institute Prize Essay, 1930

A PRIZE NOT TO EXCEED FIVE HUNDRED DOLLARS WITH A GOLD MEDAL, and a life membership in the Institute (unless the author is already a life member, in which case he will receive the commuted value thereof), is offered by the Naval Institute for the best essay submitted on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award of the prize to be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay to the Secretary-Treasurer in a sealed envelope marked "Prize Essay Contest." The name of the writer shall not appear on the essay, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary-Treasurer, with the motto on the outside and the writer's name and motto inside. This envelope will not be opened until after the decision of the board. Essays must be received on or before January 1, 1930.

3. In addition to the "Naval Institute Prize," one or more essays may receive "Honorable Mention," if of sufficient merit to justify that award; or, in the event that no essay is adjudged of sufficient merit to receive the "Prize," the best essay submitted may receive "Honorable Mention" in lieu thereof.

4. In case one or more essays receive "Honorable Mention" the writers thereof will each receive a prize, the amount of such awards to be decided by the Board of Control in each case.

5. Announcement of awards will be made as soon as practicable after January 1, 1930.

6. Essays awarded the "Naval Institute Prize" or "Honorable Mention" will be published in the NAVAL INSTITUTE PROCEEDINGS as soon as practicable. Essays not awarded a prize may be published at the discretion of the Board of Control, and the writers of such articles shall be compensated at the established rate for articles not submitted in competition.

7. Articles shall be limited to eleven (11) printed pages in the PROCEEDINGS (approximately 8,000 words), but shorter articles will receive equal consideration.

8. In event of the prize being awarded to the winner of a previous year, a gold clasp suitably engraved will be given in lieu of the medal.

9. All essays must be typewritten, double spaced, and submitted in duplicate.

R. C. MACFALL
Captain, U.S.N., Secretary-Treasurer